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The MONTHLY REVIEW

Published by the AMERICAN ELECTRO-PLATERS' SOCIETY

A Society
for the Advancement of the Science of
Electro-Plating

JULY 1936 · IN THIS ISSUE

Editorial	3
***Morgan and Lodder* — Protective Finishes on Zinc**	5
***Servis* — Efficiency in Electro-deposition vs. Electro-Chemical Equivalents**	22
Exposure Tests of Plating on Non-Ferrous Metals	31
Dangerous Electrical Wiring	33
***Eichstaedt* — The Convention of 1936**	35
1936 Convention Reports	37
The Abstract Section	40
Branch News	44
Membership Report	56
Buyer's Guide	62
Branch Directory	63

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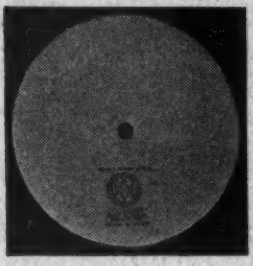

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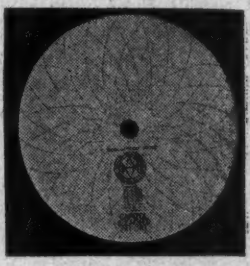

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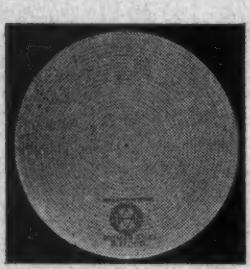

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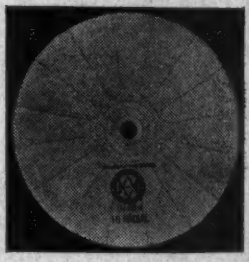

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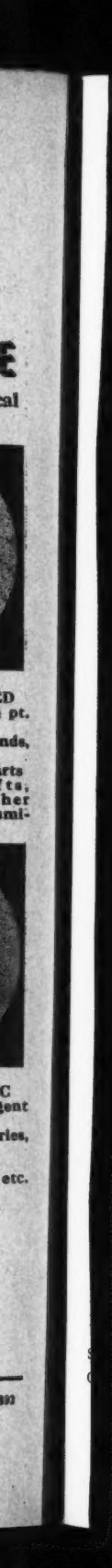

The MONTHLY REVIEW

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Editorial

At the convention in Cleveland last month, some of our members doubted the wisdom of adopting the Baltimore-Washington amendment, creating the office of executive-secretary. These delegates expressed themselves very frankly on the subject and were sincere and honest in their opposition to such a move on the part of our organization. Every change in the Constitution made in recent years has been hard fought, but we are proud of the fact that the sting of defeat has never manifested itself after the majority has declared itself either for or against the matters under discussion. The writer has had many letters from those opposing the amendment just mentioned, as well as from those who favored it--all pledging their support as the Society seeks to press forward to greater achievements in the future.

With a spirit such as this, there can be no doubt that the American Electro-Platers' Society will go forward with a steady growth in the year which is before us.

There are one or two things, however, that are necessary to assure success. We must increase our membership and our finances. Mr. P. J. Sheehan, First Vice-President, has been given a most important position as chairman of the Membership Committee. We believe President Thompson has made a wise selection. The new chairman and the newly appointed executive secretary had many dealings during the past year when Mr. Sheehan was chairman of the Educational Committee, so that we know his worth and his enthusiasm. He also has an intense desire to see the young men given a chance to lend their contribution in every way possible to the building up of the Society. Let's give the new chairman our unanimous support.

The matter of finances will determine very quickly just how long the newly created office will exist. A great part of our income must be derived from advertising. We are about to start a compaign to increase our pages in the REVIEW every month. In order to do this, each member must help. We are more entitled to subscriptions from this source than any other publication because ours is the only Society organized for dispensing knowledge on

electroplating problems which is shared by member and non-member alike. Our Society is responsible for the research work being done at the Bureau of Standards. Our Society has taken the lead in all the important developments in electroplating since its inception almost a quarter of a century ago. Our society is being recognized the world over as the most progressive organization of its kind and our publication, The MONTHLY REVIEW, is becoming the leading magazine in the industry.

Now that we have made these statements, here are some of the things we wish to do.

1. Double the circulation of the REVIEW.
2. Place the REVIEW in most of our public libraries.
3. Put on our mailing list many of our large industrial plants so that manufacturers may know what our Society is doing for the plating industry.
4. Try to make every member of the A.E.S. a salesman for the society.

The REVIEW has become much better since we have had money enough to make it self-supporting through paid advertising. We can make it still bigger and better with an increase in our advertising pages.

There are a large number of supply houses to whom we have appealed in the past without success for support in our work. A few words to the representatives of these concerns by the members of our organization will bring amazing results and help us carry on the program we have mapped out for the coming year.

In conclusion, we feel it is timely to say that we appreciate the confidence and loyalty of the members and friends of the A.E.S. and our advertisers, too, for their helpful cooperation in the past. We look forward with pleasure to a continuation of this support and assure you all that here in Springfield we are taking the appointment to this new office very seriously, realizing that with its increased opportunities there are also added responsibilities. In our connection with the A.E.S., however, we have never known its membership to fail when the occasion has arisen and are confident that spirit will continue to prevail.

Realizing our limitations as individuals we are supremely confident that with the unanimous support of you who constitute our membership, we will achieve the success we hope for. To this end, therefore, we pledge our energies and whatever ability we possess to President Thompson, the Executive Board, and every member of the American Electro-Platers' Society.

W. J. R. KENNEDY

Protective Finishes *on* Zinc*

By S. W. K. MORGAN,
A.R.S.M., B.Sc. and
L. A. J. LODDER,
A.R.C.S., B.Sc.

Paper read before the Midlands Centre, James Watt Memorial Institute Gt. Charles St., Birmingham, 3, England, on Wednesday, February 4th, 1936.

IMPORTANCE OF ZINC

THE importance of zinc in modern industry needs no emphasis. Its use by the ancients was restricted to the brass alloys, and it was not until the distillation process was established at Bristol in 1743 that the metal itself was made commercially available, but, since then, due to the development of zinc rolling and drawing, of the hot-dip and electro-galvanising processes, and still more recently of zinc-base die-casting alloys, its application has been widened enormously, and is still rapidly growing.

The reasons for this expansion arise primarily from the facts that, with the exception of iron, it is the cheapest metal upon the market and, at the same time, one of the most resistant to atmospheric corrosion.

The low cost of zinc is emphasised when we consider the prices per cubic foot of common metals ruling to-day. On this basis, a cubic foot of tin costs £43.9, of copper £8.6, of aluminum £7.5, of lead £4.8 and of zinc £2.9. It may be considered that these figures mean little, since metals are but rarely bought by the cubic foot, but they are important, since once the primary considerations of strength are satisfied, most problems of design amount to the filling of a certain bulk, which will vary but little with the choice of metal.

Zinc therefore satisfies the first and main need of cheapness, and this has led to the development of the zinc-base die-casting alloys, which are mainly of the zinc-rich aluminum type, with or without the addition of small quantities of copper or magnesium. These alloys, of comparatively low melting point, have a high castability, taking up readily fine impressions and yielding a smooth, even surface. Their physical properties are

*MS. received on 4th February, 1936.

good. Impact strength, one of the most important factors in a casting, is many times that of cast iron.

The outstanding property of zinc, however, to which most of its application is due, is its high resistance to atmospheric corrosion.

Zinc is attacked by the corrosive agencies of the atmosphere, but the attack is of a general character, and not of the more troublesome intergranular type. The possible occurrance of intergranular corrosion in zinc-base alloys, during the artificial conditions of the enamelling process, will be discussed later. Normal atmospheric attack is soon retarded by the formation on the zinc surface of a grey film of corrosion product, which consists mainly of basic zinc carbonate. This tough, tenuous coating resists further attack to a high degree. Results of exposure tests carried out in the industrial atmosphere of New York City[1], show the rate of penetration of zinc to be 0.0017" in ten years, and that of zinc-base alloys to be of the same order. We have examined a sample of zinc sheet which has been removed, in good condition, after 50 years' service at Cardiff railway station.

Therefore, it can be stated that, in general, zinc and its alloys show such a stout resistance to atmospheric corrosion, that for protection against general disintegration they need no form of artifically applied protective coating. For many purposes, however, the corrosion coat, which imparts to the metal this defensive property, is unsightly, and it is to cover its aesthetic deficiencies that the need for a finishing coat arises.

SCOPE OF THIS PAPER

Within the scope of the present paper, it is not proposed to deal exhaustively with technical details of the coatings, but rather to discuss the considerations which arise from the inherent properties of the underlying metal, and which must be borne in mind in the application of finishing coatings to zinc or zinc-base alloys.

Available processes may be classified under the following headings:—

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(1) Anon. "Zamak Alloys for Zinc Alloy Die-Castings," The New Jersey Zinc Company New York, 1935.

(1) Electro-plating with chromium, nickel, copper and silver.
(2) Electrolytic treatment.
(3) Painting, enamelling, lacquering and varnishing.
(4) Chemical colouring processes.
(5) Production of stained or dyed corrosion coats.

We propose to deal with those various processes in outline, and to summarize the reactions of the metal during the operations which are involved.

ELECTRO-PLATING ON ZINC AND ZINC-BASE ALLOYS

Electrodeposition is undoubtedly one of the most important and widely applied methods of protecting and decorating zinc. Coatings of chromium, nickel, copper and of silver have very considerable application.

We propose, however, to omit this section since much has been written during the past few years concerning the plating of zinc and zinc-base alloys.

It is sufficient to remark here that no special difficulties present themselves in the deposition of plated coats, provided that the usual standards of degreasing and precleaning are rigidly maintained.

We will therefore pass on to deal with other types of coating, about which less information has been published.

ELECTROLYTIC TREATMENT

Electrolytic processes for coating zinc include the Schulein and anodic treatments.

In the Schulein process[2], of American origin, cleaned zinc articles are made the electrodes in a chromic acid bath containing a low percentage of sulphuric acid. Low voltage alternating current is applied. The action is not critical, and working conditions may be varied over wide limits. The coating, which is black, can be formed in a period varying from a few seconds to several minutes, and though somewhat sombre in colour, shows enhanced resistance to ordinary atmospheric corrosion and to salt spray. The process has been suggested for continuous treatment of galvanised wire, to be applied at the same rate as it is manufactured.

(2) Schulein. Amer. Electrochem. Soc., Preprint (Sept., 1934), 357.

Attempts have been made to apply to zinc the anodic oxidation treatment which has been developed with such success in the case of aluminium. Unfortunately, zinc lacks to a considerable extent the properties which make aluminium so singularly responsive to this treatment. Its oxide does not form that thick, tenuous film, well bonded to the lattice of the metal below, which sheathes aluminium so protectively, and neither has it that high capability for absorbing and mordanting dye.

The anodic treatment[3] has, however, yielded some success with zinc. As with aluminium, when zinc is made the anode, with rising voltage, in an appropriate electrolytic bath, a reinforced oxide coating can be built up, which maintains its light-grey coat under the milder corrosive influences of the atmosphere, but which is attacked more readily under slightly acidic conditions than is the corresponding aluminium oxide coat.

Solutions employed for the treatment include the hydroxides and carbonates of sodium and ammonium respectively, and barium hydroxide. It is also possible to use alkaline electrolytes containing compounds of amphoteric metals.

The process is yet in embryo and is receiving further investigation, but it is doubtful whether its application will ever be widespread. The principle, however, of protecting zinc with an artificial corrosion coat has been applied practically in the dichromate dip and in the chemical dip finish, which will be discussed later.

PAINTING ON ZINC

The task of securing permanent adherence of paint films on any metal surface is a difficult one.

Considerations of the problems involved in the painting of zinc will be clarified if we descend somewhat to fundamentals and recall the essential nature of the paint film. Paint is essentially a mixture of an opaque pigment with non-volatile oil, with or without the addition of a volatile thinner. The non-volatile oil is one or more of the vegetable drying oils, which dry and harden by absorbing oxygen from the air. Initial adherence will depend upon the extent to which the liquid paint "wets" the metal surface, and the possibility of mechanical anchorage

(3) U. S. Pat. 1,953,997—1,954,000.

by penetration of paint into pores and pits in that surface. Subsequent adherence will be governed by the stability or otherwise of the super-imposed paint coating in relationship to the metal beneath. Let us see how zinc fulfills these conditions.

The first point to note is that over practically every freshly fabricated surface of zinc and other metal sheets, and of galvanised ware, films of oil and grease exist. These films are due to the remnants of tallow and fluxes from the rolling and galvanising operations. The deleterious effect which such grease films will have on the adherence of the paint films need not be emphasised.

Another factor which militates against adherence is the high finish zinc and other metals acquire during fabrication. Zinc sheet, freshly rolled, has a mirror-like surface. Die-castings have also a smooth finish, due to the chilling effect of the mould, and though this is often an advantage, since such surfaces need the minimum of buffing or polishing, it follows that they have but few pores or pits by which any super-imposed paint film can be keyed. Again, in the case of galvanised ware, the high spangle, which is an attractive feature and much sought after, is given by a coarse crystalline structure, which presents but little opportunity for this vital keying. General experience seems to indicate that the matte, spangle-free surface, although much less attractive, gives better support to the paint film, and consequently better adherence.

The high co-efficient of expansion of zinc and other metals relative to that of the paint film has also to be considered. Due to this, under alternations of temperature, the film tends to be torn away from its hard-won anchorage, although a quality paint made with good oils should resist this tendency to a considerable degree, by virtue of its distensibility. This inclination to rupture is, however, always present, and should be borne in mind.

The adverse factors affecting the adherence of paint films to zinc and other metals are not all physical. Varnish and paint films are all slightly acid in character, and tend to react with an untreated zinc surface. Paint flaking from galvanised iron has been shown to be coated with zinc formate on the under side,

(4) Wing, Ind. Eng. Chem., 1933, 27, 1149.

while no trace of formate has been detected in flakes of paint from an iron surface after the same time of contact[4]. This point will be considered later when dealing with primers and paints suitable for galvanised ware.

The combination of grease, smooth surface, high thermal expansion, and chemical activity, is a formidable one. Fortunately, there are methods for pretreating the zinc surface which lessen to a considerable degree the effect of these factors, and these should be applied if the continued adherence of the paint is to be relied upon.

The first, which has the overwhelming advantage of cheapness, is that of simple exposure to atmospheric attack. If the surface of zinc sheet or of galvanized iron be allowed to "weather" *in situ* for some three months, and the resulting corrosion coating well scoured with a wire brush, increased adhesion is given to most paints. The effect of this treatment is to remove grease films and to form an oxide-carbonate film, which gives increased keying to the paint, and is chemically less reactive than a bright metallic surface. The disadvantage of the treatment is that it does not give uniform results.

Sandblasting constitutes a more efficient method of pretreatment. It has the advantage of degreasing the surface and of breaking it up, thus affording considerably increased mechanical anchorage, but it tends to increase the reactivity of the metal.

Several chemical methods of pretreatment are in use and can be recommended. Weak acid solutions have been proposed. These tend to degrease and to etch the surface. The use of vinegar was widely advocated at one time for galvanized sheet. It was applied by brush and allowed to remain on the surface for five minutes, after which it was wiped off and the surface washed down. This procedure has the advantage of cheapness and simplicity. Other mixtures recommended are:—

(*a*) Hydrochloric acid and ammonium nitrate[5].
(*b*) Copper acetate[6].
(*c*) Hydrochloric acid and copper chloride (recommended by the U. S. Government)[7].
(*d*) Acid-tuluol-alcohol mixture[8].

This latter is certainly one of the best of these methods.

(5) Perry, Industrial Finishing, 1933, **9**, 11—12.
(6) Anon. "The Painting of Galvanised Iron," The New Jersey Zinc Company, New York, 1932.
(7) Imhoff. Amer. Metal Market, 1934, **41**, (220), 6, 8.
(8) Anon. "The Painting of Galvanised Iron," The New Jersey Zinc Company, New York, 1932.

Considerable progress has lately been made by the development of the "Granodine" and "Lithoform" treatments. These processes consist of treating the surface, either by brushing or dipping with a solution of the phosphoric acid type. A dull surface, apparently of zinc phosphate, forms, to which the adherence of paint is considerably enhanced, and the processes seem to eliminate the paint-bearing short-comings of zinc. The surface is freed from grease, and gives increased anchorage with but little tendency to react with the film of dried vehicle. The cost of application is apparently low and a strong case exists for its adoption, due to the prolonged paint life which is given, for most work, where, for purposes of decoration, surfaces of galvanized iron and zinc sheet have to be painted.

From the point of view of the relative suitability of the various types of paint available for use on zinc, it can be stated generally that those containing pigments of a more basic character give the best service.

Iron oxide primers[9] have been used with success on zinc-base die-castings, while red lead primers[10] do not appear to be suitable except on sandblasted surfaces. A primer which, it is claimed, resists to a high degree temperature changes accompanying severe climatic conditions, is made up with Portland cement and various basic pigments[11]. It has been found to give satisfactory service on zinc sheet and galvanized iron used for lining refrigerators.

One of the best paints for use on zinc, from the point of view of adherence, is one containing a mixture of metallic zinc dust and zinc oxide[12], which gives a battleship grey colour. This paint is particularly suitable for galvanized iron subjected to salt water exposure, while addition of aluminium powder affords protection against fresh water and humid conditions[13]. The pigments containing metallic dust can be worked up into paints giving high distensibility and the minimum of interaction with the metal surface which they cover. It is of interest to note that an investigation into the acidity of paint and varnish films showed zinc oxide to be the only pigment with a *p*H value greater that 5[14].

(9) Parkinson & Faulhaber. Iron Age, 1933, **131**, 783.
(10) Imhoff. Amer. Metal Market, 1934, **41**, (220), 6, 8.
(11) Perry. Industrial Finishing, 1933, **9**, 11—12.
(12) Imhoff. Amer. Metal Market, 1934, **41**, (220), 6, 8.
(13) Anon. Metal Cleaning and Finishing, 1935 (Oct.), 513.
(14) Wolff. The Paint Varnish Production Manager, 1935, 13 (Aug.), 7—8, 10.

ENAMELLING

The next section, that which includes the enamelling, lacquering and varnishing of zinc is of the greatest importance, since these types of coatings are finding rapidly increasing application on zinc-base die-casting alloys. By means of them, the advantages of cheapness and castability can be augmented with the extraordinarily rich shades of colour which are such a feature of modern lacquers and enamels.

In pressure die-casting, pressure is applied to the metal either mechanically or pneumatically and it enters and fills the cool mould at high velocity. It rapidly cools, sets, is ejected, and the process repeated. By this process, due to the fluidity of the alloys, smooth surfaces with a high degree of polish can be obtained, which faithfully reproduce the details of the polished mould.

The features of the surface of an object cast in this manner, which affect the subsequent finishing operations, can be classified as follows:—

(*a*) Flow-marking.
(*b*) Porosity.
(*c*) The skin of the casting.

Flow-marking and porosity are defects to which all chill-cast surfaces are subject. The former is caused by incipient solidification and oxidation as the mould is filled, tending to give the effect of folding, or lapping of the metal. Porosity is due, of course, to shrinkage on crystallisation, and to entrained gases. Zinc-base die-casting alloys suffer relatively very little from these defects, which can be reduced to an almost negligible degree by correct die design and careful control of metal and die temperatures during the casting operation. The metal finisher should see that the die-caster gives him the high quality of surface which is possible and to which he is entitled.

Die-castings are chilled castings, and the outer surface consists of a skin of chilled metal which differs in structure from the main body of the metal immediately beneath. The crystal size is considerably finer and the phases are very evenly distributed. Consequently, the structure is, in general, much more regular than that of the metal below, and this should be borne in mind

when sandblasting, since, if this skin is removed to varying degrees, lack of uniformity in the final finish may result.

These are features due to the conditions under which the metal is cast. A factor of considerable importance, particularly in the enamelling process, arises from the physical nature of the alloys themselves. Formerly, at temperatures exceeding 100°C., in the presence of steam, zinc alloys were liable to intercrystalline corrosion with consequent weakening and distortion. The attack was rapid with low-grade alloys, developing to a serious degree within a few hours. The explanation appears to lie in the fact that traces of impurities, such as lead, tin, and possibly cadmium, are deposited at the grain boundaries and accelerate the spread of the intergranular type of corrosion along them. This trouble has been overcome by the use of highly pure zinc in the manufacture of the alloys, and now, with alloys which are readily obtained commercially made up from zinc of a purity exceeding 99.99%, it is possible to enamel safely at temperatures up to 350°F. (177°C.).

Having now discussed the nature of the die-cast surface, let us turn briefly to a consideration of the enamelling, lacquering and varnishing procedures most suitable.

The conditions necessary for good adherence of these coats are similar to those for painting, and the same limitations which have been dealt with in that section hold, and must be overcome. As before, some kind of pretreatment is advisable, and should be even more thorough.

Efficient cleaning is vital. Of the chemical methods, one of the best is cathodic cleaning in tri-sodium phosphate solution, containing 37.5 gm. per litre. An immersion period of 1½ minutes, sufficient to cause violent evolution of gas from the castings, followed by rinses in hot and cold water, ensure complete freedom from grease. Strong alkaline solutions are sometimes employed for cleaning, but unless rinsing is thorough, there is a tendency to leave a deposit of a film of alkaline salt over the surface during drying. A weak acid wash prior to the rinse reduces the possibility of this occurring. Degreasing by means of volatile solvents, such as trichlorethyline, is efficient,

and gives satisfactory results. Cleaning operations should always allow for removal not only of grease and oil, but also of films of oxide and other reaction products which may form during storage or cleaning. It is also important that no re-formation of these films occurs, and finishing operations should follow immediately after cleaning and drying.

In the case of zinc-base alloys which contain copper, care should be taken in the pickling operation, since if it be prolonged, there is a tendency for a film of loosely-adherent copper to be redeposited. Should this occur, the film must be removed by vigorous brushing or scouring.

Mechanical cleaning by sandblasting is undoubtedly one of the most effective methods. Sand or grit classifying at 80 to 100 mech I.M.M. has been found most effective. Sandblasting must never be excessive, since it is liable to open up sub-superficial pores. Gas evolved from such pores during the stoving operations is a frequent cause of the troublesome enamelling complaint known as "pimpling."

As was mentioned during the discussion on the painting of zinc, the tendency of that metal to react with the vehicles of the enamel or varnish cannot be ignored. Some recent work has shown that with certain enamels there occurs diffusion of zinc through the coating. This was demonstrated by incorporating alizarin in the enamel and noting the progressive change in colour. This tendency, due to the chemical activity of zinc can, as is the case with paint, be almost entirely overcome by the "Granodising" treatment.

Given thoroughly efficient pretreatment, satisfactory adhesions of a wide range of enamels and varnishes may be obtained on zinc. One coat is sometimes used, but for work of the highest quality, two or three coats are desirable. If a priming coat is employed, it should contain pigments of a basic character to ensure prolonged adhesion.

It is not possible in a short space to enumerate the types of enamel in use on zinc. Each manufacturer has his own recipes and methods, and provided the peculiarity of the metal being

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(15) Anon. Paint Manuf., 1932, **2**, 267.

covered is remembered, in most cases satisfactory finishes can be obtained.

It can be stated generally that the modern synthetic resin baked enamels give superior service in every way to the older, natural gum type. The Glyptal enamels of the glycerol phthallate type have had considerable application. Japans with high oil content, containing the mineral gilsonite, are available. These can be baked at 300°F., and give a pleasing, permanent black finish on zinc.

The question of stoving temperature during the enamelling procedure is of considerable importance. With high-grade alloys manufactured from zinc of the highest purity, stoving temperatures of from 300 to 350°F., depending upon the composition of the alloys, can be safely used. These temperatures are sometimes exceeded with lightly stressed parts, but it is dangerous to do this, and the practice cannot be recommended. If light-coloured enamels are used, baking temperatures should not exceed 225°F., since above this temperature, there is a tendency for zinc to darken slightly the enamels. The liability of low-grade zinc-base alloys to suffer from rapid intercrystalline corrosion at temperatures above the boiling point of water has been stressed before. Their use in castings which are to be stoved entails the risk of considerable trouble.

LACQUERING AND VARNISHING

Lacquers give service on zinc which is inferior to that obtainable with enamels, especially those of the baking type. They have less covering ability, and require more costly thinners and more careful pretreatment. Generally, a lacquer is used where rapid drying is desired and no baking equipment is available.

Highly polished zinc has a colour not unlike that of polished chromium. The metal tarnishes readily in the atmosphere, but use of a clear lacquer will prevent this, and at a cost less then that of plating. Some lacquers on zinc show a tendency to discolour during baking, and care must be exercised if a baking operation is included, to avoid any tendency to overheat the casting.

Although direct application of a lacquer is premissible, its

adherence is considerably improved if a primary coat, preferably of the oxidising oil type, is first baked on the casting. The primer must be completely oxidised before the lacquer is applied, otherwise blistering will occur.

Generally, lacquers cannot be relied upon to resist heavy wear, and do not show great resistance to perspiration or to the action of soapy water. In consequence, they cannot be recommended for use on kitchen appliances.

Synthetic varnishes are a good deal more resistant, and some have a durability comparable with that of an enamel, but since to-day the demand is for colour, which can be satisfied without adding materially to the cost of finish, varnishes have not a wide field of use on metal ware.

THE DICHROMATE DIP

Dealing with the purely chemical methods of protecting and decorating zinc, the first example is the dichromate dip[16]. This process has had a considerable application in the United States. It gives to zinc an increased resistance to the action of water, and inhibits the formation of the film of corrosion products, which is unsightly when excessively developed, and may interfere with the free play of moving parts.

The action of the process depends upon the fact that when clean zinc is immersed for a short period in an acid dichromate solution, a coating is produced consisting of sparingly soluble zinc chromate, which is unaffected by oxidising agents, and prevents corrosion for some considerable time.

The treatment is cheap and simple, requiring but little plant. Rinses given after cleaning and after the immersion treatment must be thorough and preferably the coating is dried in a blast of cool air.

The solution is used at room temperature, since a too rapid formation of film results in poor adherence. Immersion times ranging from 5 to 20 seconds are permissible, but 10 seconds is usually sufficient. The coating thickens and darkens with increase of immersion time, but unless appearance is the deciding

(16) Private Communication.

factor, thin coats are preferred, since they dry more rapidly and yield better resistance to abrasion at sharp corners.

The process is widely applied in the United States. Its first use was in parts of petrol handling devices, where it overcame the problem of corrosion caused by the presence of water in the petrol. In that country, it is applied almost universally to motor-car carburettors, and has also solved the vexed problem of the sticking of motor-car door locks, the zinc alloy parts of which are now mainly treated by this process. The fact that the locks are 37% of the four million cars produced annually in the U. S. A. are now being dichromate-treated in one 10-gallon tank demonstrates the simplicity and speed of the process.

CHEMICAL COLOURING OF ZINC

Chemical colouring of a metal implies the production on its surface of an adherent coating of metallic compound of the desired colour. Often the treatment is carried out with a view to giving new metal articles the appearance of age, or it may be that the frequent polishing necessary to keep the metal in bright condition is to be obviated.

Almost all chemical compounds of zinc are white; hence, in order to impart a coloured appearance to objects of zinc, it is necessary that a compound of some other metal be employed. This is generally a copper salt.

Of all the methods for finishing zinc, which have been discussed so far, the chemical method is the one which demands the most thorough cleanliness and freedom from defect of the metal surface, since it is only on perfectly clean metal that a chemical action will proceed uniformly. Chemical coating processes rely almost invariably on simple replacement and the films formed will, therefore, be of molecular thickness, masking but little defects in the metal below.

Recipes of solutions for colouring zinc are many and varied. These can be found in patents and other published literature. They are applied by brushing, or by immersion. Many are applicable both to rolled zinc and to zinc alloys, though the alloying elements present in the latter often have a pronounced effect on the colour produced.

Copper, brass or bronze coatings may be applied to zinc by simple immersion in appropriate solutions, but they tarnish rapidly unless protected by waxing or lacquering.

Methods of blackening zinc usually depend upon the formation of an oxide of copper, though solutions which include salts of antimony, nickel and manganese are in use. We have ourselves used a solution containing copper nitrate, and chloride, ammonium chloride and hydrochloric acid. With correct pretreatment, a good, durable ebony shade is produced, but if precleaning be imperfect, the colour may have a greyish tinge and lack uniformity. This dip, on zinc-base alloys, tends to produce a reddish-coppery hue unless a small addition of antomony chloride be made.

Films of a protective nature may be formed by the use of molybdate solutions, to which various salts are added to improve the coating. In general, these methods are protected by patents.

Methods exist for artificially producing green patinas on copper. These apply equally well to zinc or zinc-base alloys which have been copper-plated. Zinc itself can be given the appearance of age with a greyish patina. Coatings of patina are protective, and are recommended for outdoor exposure. Thus, roofing sheet with a coating of patina, is more pleasing in appearance than ordinary weathered zinc, and green roofing tiles, a conspicuous feature of several modern blocks of flats, consist of zinc sheet which has been given a copper flash and an artificial patina.

In addition, multi-coloured effects are obtainable on zinc, which are due to the deposition of transparent films which are so thin that diffraction occurs. The colour of the film is dependent on its thickness, and a variety of colours is possible with varying immersion time.

Many of these chemically-produced films are merely decorative, and have little protective value unless subsequently lacquered or otherwise protected. In consequence, they are seldom used for outdoor exposure.

CHEMICAL DIP FINISH

This is a process upon which we have been working ourselves.

Its conception was due to an attempt to produce dyed coats on zinc, analogous to the anodic colours which can be produced on aluminium. As has been mentioned before, zinc oxide lacks almost entirely the unequalled capacity of the aluminium oxide film for absorbing and mordanting dye. We have found, however, that coatings of certain organic zinc salts, when produced under specified conditions, are able, in a limited degree, to absorb dye. Such salts have the added advantage, by virtue of their relative insolubility, of giving to zinc a considerable protection against corrosion, especially if by control of the conditions, they are built up on the zinc surface so as to form an impermeable coat. This latter phenomenon is well known and has been the subject of several patents.

Our aim has been so to form the corrosion resisting coat, that its capacity to absorb dye is at a maximum. We have found that the conditions most favorable to this end are obtained by the use of cold saturated solutions of the corroding media.

Our normal method of operation at the moment is to take the die-casting and, after buffing, to clean it in a trichlorethylene bath. It is then given an acid pickle, and suspended in a cold saturated solution of oxalic acid until evolution of gas has substantially ceased, after which it is rinsed in water and immersed in hot dye solution. After immersion for one hour, it is removed, rinsed and finished with a light rubbing or buffing.

If a matte finish is desired, the castings are sand or shot-blasted prior to the acid dip. This procedure is not only considerably cheaper, since it eliminates the buffing and degreasing operations, but it also gives increased wear resistance to the dyed film, though a matte sand-blasted surface is certainly less attractive than a buffed one.

The process still requires further investigation. The number of dyes with which we can obtain uniform results is limited, and the colours produced are sombre. The corrosion coat initially obtained is not yet perfect, and does not fully resist atmospheric corrosion. Therefore, we cannot recommend it for outdoor exposure, though it seems quite stable for internal fittings. The

wear-resisting qualities of the coating seem fairly high. We have dyed handles on laboratory doors, constantly used by people with hands often wet with chemicals, and have found that under these severe conditions, even after three months, little deterioration had taken place. We have also another knob which has been for over a year on the door of a bathroom, and is still in good condition.

Work is proceeding in attempts to strengthen the coat and to increase its capacity to absorb dyes, and we feel hopeful that along these lines a method of producing on zinc, durable, decorative coats, which are comparatively cheap, will shortly be realised.

There are other miscellaneous methods in use for coating zinc. The material known as Zinkan consists of zinc sheet, upon which has been rolled thin sheets of aluminium. The claims made for this material are that the presence of the aluminium lowers the cost of fabrication, and also gives increased resistance to certain types of atmospheric corrosion.

Coatings on die-castings, obtained by dipping in molten tin or lead, in a process analogous to that of hot-dip galvanizing, have been applied in certain cases, where special corrosive agents are encountered, demanding a surface of these metals. In order to secure adhesion, the castings are first given a coat of electrolytic nickel.

It is hoped that the conclusion will not be drawn from the above summary that zinc is a metal upon which finishes can only be applied with especial difficulty. The production of an enduring finish on any metal is not a simple operation. due to the non-absorbent nature of the surface. Other factors also resist adhesion, and it is only by giving careful consideration to these that satisfactory service can be obtained. The properties of zinc have been dealt with in some detail, so that the proper precautions can be taken. If this is done, zinc can receive to the full its share of the many attractive, durable finishes now available. It has the added advantage that, should the finish be pierced, the underlying metal still stoutly resists corrosion.

NEW BRIGHT NICKEL PROCESS

The Hanson-Van Winkle-Munning Company of Matawan, N. J., has been designated sole representative in the United States for exploitation of the new patented Bright Cobalt Nickel Process recently developed by Weisberg & Greenwald, Inc., of New York City.

A distinguishing feature of this bright nickel solution is the fact that the deposit contains some cobalt. In operation this is supplied from anodes for which reason special cobalt nickel anodes are used.

The deposits produced from this solution with the addition of brightening agents are said to have a mirror-like brightness. The brightening agents can readily be analysed and controlled.

The notable features claimed for deposits of bright nickel are the bluish white color of the deposit which gives an enhanced cadmium finish, its ductility, the high current densities possible and the ability to control the solution at all times.

NEWS ITEM

The Lea Manufacturing Company of Waterbury, Conn., has added a complete line of sawdust to its already extensive line of platers' supplies. It is carrying hardwood, kiln dried sawdust ranging from the finest to the coarsest.

HANSON-VAN WINKLE-MUNNING CO. ISSUE NEW CATALOGUE

The Hanson-Van Winkle Munning Co. have recently issued a new catalogue Bulletin No. P. B. 105, which describes and illustrates the latest designs in single cylinder, multiple cylinder oblique jeweler's plating barrels and multiple plating and rinsing machines. A standard equipment chart is also included in the catalogue. A copy will be mailed on request.

THE "BAKER RHODIUM COMPARATOR"

BAKER & CO., Inc., NEWARK, N. J.

The outfit is composed of a mahogany comparator housing, two graduated pyrex glass comparison tubes, fifty capsules of developing salt, one pipette, a test-tube holder, a bottle of Baker standard rhodium plating solution and a diluting dropper. It sells complete for $6.00 and will enable the user to determine at any time how much rhodium he has in his plating bath at a cost of only a few cents for each test.

NEWS ITEM

Rudolf Neuburger has resigned as an executive of Atlas Powder Company to become assistant to the President of United Wall Paper Factories, Inc.

A graduate of Cornell University, class of 1911, he is a recognized authority on economics and the problems of distribution.

Mr. Neuburger will assume his new duties on June 1st. It is expected that for the present he will make his headquarters at the company's general office in Jersey City.

THE EGYPTIAN LACQUER MANUFACTURING CO. announces the removal of its offices to Rockefeller Center, 1270 Sixth Avenue, New York.

We have had several requests for this paper, read at the Chicago banquet by Past President Oscar E. Servis, of Chicago Branch, May, 1918.
Reprinted from May 1918 issue of the MONTHLY REVIEW.

Efficiency in Electrodeposition *vs.* Electro-Chemical *Equivalents*

By OSCAR E. SERVIS

(Read at the Chicago Banquet)

IN this paper it is not the intention of the writer to enter into any complicated theoretical discussions, but simply to present a few simple laws and principles of electrodeposition which can be applied and worked out in shop practice, especially where conditions warrant or demand systems of efficiency and reasonable accuracy.

It will not be said that these methods are applicable in the small shop or plant where the time and investments for the necessary tools or instruments may be questioned too greatly, nor will, especially the deposition of gold or the rare metals, be quoted inasmuch as this branch of the platers' field is generally specialized and is too varied in its demands; nevertheless, these methods can be applied where, as already stated, conditions and requirements may warrant it and where accuracy is required.

In the deposition of metals as copper, nickel, brass, zinc, etc., it is a question among platers how much metal is deposited on a metallic surface. The prevailing practice of allowing the work to run for a certain length of time and judge the thickness by the appearance of the deposit is not a realiable indicator, as, for instance, when nickel is deposited from a double sulphate solution, most platers will leave the work in the bath until a good matt or white deposit is obtained, and while this may be a sufficient deposit for the work in hand, yet should the deposit be from a

Valence 29.5

NICKEL 1.085 Gr.

Theory Gram × Per-Cent Cathode Efficiency = Actual Metal Deposited

ELECTRO-CHEMICAL EQUIVALENT

Amps.	MINUTES.											
	5	10	15	20	25	30	35	40	45	50	55	60
1	.0904	.181	.271	.361	.45	.54	.63	.72	.81	.904	.99	1.08
2	.181	.361	.54	.72	.904	1.08	1.26	1.44	1.62	1.81	1.98	2.16
3	.271	.54	.81	1.08	1.35	1.62	1.89	2.16	2.44	2.71	2.98	3.25
4	.36	.72	1.08	1.44	1.81	2.16	2.53	2.89	3.25	3.61	3.97	4.33
5	.45	.904	1.35	1.81	2.26	2.71	3.16	3.61	4 06	4.52	4.97	5.42
10	.904	1.81	2.71	3.61	4.52	5.42	6.32	7.23	8.13	9.04	9.94	10.8
15	1.35	2.71	4.06	5.42	6.78	8.13	9.49	10.8	12.2	13.5	14.9	16.2
20	1.81	3.61	5.42	7.23	9.04	10.8	12.6	14.4	16.2	18.1	19.8	21.6
25	2.26	4.52	6.78	9.04	11.3	13.5	15.8	18.1	20.3	22.6	24.8	27.1
30	2.71	5.42	8.13	10.8	13.5	16.2	18.9	21.6	24.4	27.1	29.8	32.5
35	3.16	6.32	9.49	12.6	15.8	18.9	22.1	25.3	28.4	31.6	34.8	37.9
40	3.61	7.23	10.8	14.4	18.1	21.6	25.3	28.9	32.5	36.1	39.7	43.3
45	4.06	8.13	12.2	16.2	20.3	24.4	28.4	32.5	36.6	40.6	44.7	48.8
50	4.52	9.04	13.5	18.1	22.6	27.1	31.6	36.1	40.6	54.2	49.7	54.2
55	4.97	9.94	14.9	19.8	24.8	29.8	34.8	39.7	44.7	49.7	54.6	59.6
60	5.42	10.8	16.2	21.6	27.1	32.5	37.9	43.3	48.8	54.2	59.6	65.1
65	5.87	11.7	17.6	23.5	29.3	35.2	41.1	47.1	52.8	58.7	64.6	70.5
70	6.32	12.6	18.9	25.3	31.6	37.9	44.2	50.6	56.9	63.2	69.6	75.9
75	6.78	13.5	20.3	27.1	33.9	40.6	47.4	54.2	61	67.8	74.5	81.3
80	7.23	14.4	21.6	28.9	36.1	43.3	50.6	57.8	65.1	72.3	79.5	86.7
85	7.68	15.3	23.1	30.7	38.4	46.1	53.7	61.4	69.1	76.8	84.5	92.2
90	8.13	16.2	24.4	32.5	40.6	48.8	56.9	65.1	73.2	81.3	89.4	97.6
95	8.58	17.1	25.7	34.3	42.9	51.5	60.1	68.7	77.2	85.8	94.4	103.1
100	9.04	18.1	27.1	36.1	45.2	54.2	63.2	72.3	81.3	90.4	99.4	108.4

SILVER 62.1 Grains.

ELECTRO-CHEMICAL EQUIVALENT

Amps.	MINUTES.											
	5	10	15	20	25	30	35	40	45	50	55	60
1	5.17	10.3	15.5	20.7	25.8	31.1	36.2	41.4	46.5	51.7	56.9	62.1
2	10.3	20.7	31.1	41.4	51.7	62.1	72.4	82.8	93.1	103.5	113.8	124.2
3	15.5	31.1	46.5	62.1	77.6	93.1	108.6	124.2	139.7	155.2	170.7	186.3
4	20.7	41.4	62.1	82.8	103.5	124.2	144.9	165.6	186.3	207	227.7	248.4
5	25.8	51.7	77.6	103.5	129.3	155.2	181.1	207	232.8	258.7	284.6	310.5
10	51.7	103.5	155.2	207	258.7	310.5	362.2	414	465.7	517.5	569.2	621
15	77.6	155.2	232.8	310.5	388.1	465.7	543.3	621	698.6	776.2	853.8	931.5
20	103.5	207	310.5	414	517.5	621	724.5	828	931.5	1035	1138	1242
25	129.3	258.7	388.1	517.5	646.8	776.2	905.6	1035	1164	1293	1423	1552
30	155.2	310.5	465.7	621	776.2	931.5	1086	1242	1397	1552	1707	1863
35	181.1	362.2	543.3	724.5	905.6	1086	1267	1449	1630	1811	1992	2173
40	207	414	621	828	1035	1242	1449	1566	1863	2070	2277	2484
45	232.8	465.7	698.6	931.5	1164	1397	1630	1863	2095	2328	2561	2794
50	258.7	517.5	776.2	1035	1292	1552	1811	2070	2328	2587	2846	3105
55	284.6	569.2	853.8	1138	1423	1707	1992	2277	2561	2846	3130	3415
60	310.5	621	931.5	1242	1552	1863	2173	2484	2794	3105	3415	3726
65	336.3	672.7	1009	1345	1681	2018	2354	2691	3027	3363	3700	4036
70	362.2	724.5	1086	1449	1811	2173	2535	2898	3260	3622	3984	4347
75	388.1	776.2	1164	1552	1940	2328	2716	3105	3494	3881	4269	4657
80	414	828	1242	1656	2070	2484	2897	3312	3726	4140	4554	4968
85	429.8	879.7	1319	1759	2199	2639	3079	3519	3958	4398	4838	5268
90	455.7	931.5	1397	1863	2328	2794	3260	3726	4191	4657	5123	5579
95	481.6	983.2	1474	1966	2458	2949	3441	3933	4424	4916	5407	5889
100	507.5	1035	1552	2070	2587	3105	3622	4140	4657	5175	5692	6200

single salt solution, it would be considerably brighter in the same time and yet the article would appear to have an insufficient coating, while in reality it may be considerably more than the first mentioned.

The reason why this is so is because in the double sulphate solution without any additional agent, the deposit is more spongy and frosted in appearance, while from the single sulphate solution, which always contains boric acid, the particles of metals are laid down and as a consequence are much brighter in appearance, which leads to the belief that little of the metal has been deposited, when, as a matter of fact, quite the reverse is true. This is especially true if the deposit is placed upon a highly polished surface; this difference in color of the deposit frequently leads to error as to the length of time really necessary for laying on the proper coating to suit the work at hand, and is one of the reasons "why" we have pitting. This error is largely due to the fact that the plater is not familiar with the laws that govern the rate of deposition or to the lack of proper instruments with which to measure the same.

Faraday's law informs us that the weight of any substance liberated or deposited from an electrolyte is directly proportioned to the quantity of electricity flowing through the circuit and the time.

The weights of different substances liberated or deposited by the same quantity of electricity are proportional to their respective electro-chemical equivalents.

If, therefore, a definitely measured quantity of electricity flowing through an electrolyte is found to deposit one gram of the metal concerned, then doubling this quantity of electricity flowing through the same solution will deposit twice as much, or two grams.

As is seen, the weight of metal deposited from a solution de-

Valence 108
SILVER 4.025 Gr.
Theory Gram × Per-Cent Cathode Efficiency = Actual Metal Deposited
ELECTRO-CHEMICAL EQUIVALENT

Amps.	MINUTES.											
	5	10	15	20	25	30	35	40	45	50	55	60
1	.335	.67	1.006	1.34	1.67	2.01	2.34	2.68	3.01	3.35	3.68	4.02
2	.67	1.34	2.01	2.68	3.35	4.02	4.69	5.36	6.03	6.7	7.37	8.05
3	1.006	2.01	3.01	4.02	5.03	6.03	7.04	8.04	9.05	10.06	11.06	12.07
4	1.34	2.68	4.02	5.36	6.7	8.04	9.39	10.7	12.07	13.4	14.7	16.1
5	1.67	3.35	5.03	6.7	8.38	10.06	11.7	13.4	15.09	16.7	18.4	20.1
10	3.35	6.7	10.06	13.4	16.7	20.1	23.4	26.8	30.1	33.5	36.8	40.2
15	5.03	10.06	15.09	20.1	25.1	30.1	35.2	40.2	45.2	50.3	55.3	60.3
20	6.7	13.4	20.1	26.8	33.5	40.2	46.9	53.6	60.3	67.08	73.7	80.4
25	8.38	16.7	25.1	33.5	41.9	50.3	58.6	67	75.4	83.8	92.2	100.6
30	10.06	20.1	30.1	40.2	50.3	60.3	70.4	80.4	90.5	100.6	110.6	120.7
35	11.7	23.4	35.2	46.9	58.6	70.4	82.1	93.9	105.6	117.3	129.1	140.8
40	13.4	26.8	40.2	53.6	67.08	80.4	93.9	107.3	120.7	134.1	147.5	160.9
45	15.09	30.1	45.2	60.3	75.4	90.5	105.6	120.7	135.8	150.9	166	181.1
50	16.7	33.5	50.3	67.08	83.8	100.6	117.3	134.1	150.9	167.7	184.4	201.2
55	18.4	36.8	55.3	73.7	92.2	110.6	129.1	147.5	166	184.4	202.9	221.3
60	20.1	40.2	60.3	80.4	100.6	120.7	140.8	160.9	181.1	201.2	221.3	241.4
65	21.8	43.6	65.4	72.2	109	130.8	152.6	174.4	196.2	218	239.8	261.6
70	23.4	46.9	70.4	93.9	117.3	140.8	164.3	187.8	211.3	234.7	258.2	281.7
75	25.1	50.3	75.4	100.6	125.7	150.9	176	201.2	226.3	251.5	276.7	301.8
80	26.8	53.6	80.4	107.3	134.1	160.9	187.8	214.6	241.4	268.3	295.1	321.9
85	28.5	57.01	85.5	114	1425	171	199.5	228	256.5	285	313.8	342.1
90	30.1	60.3	90.5	120.7	150.9	181.1	211.3	241.4	271.6	301.8	332.3	362.2
95	31.8	63.7	95.5	127.4	159.3	191.1	223	254.9	286.7	318.6	350.7	382.3
100	33.5	67.08	100.6	134.1	167.7	201.2	234.7	268.3	301.8	335.4	369.2	402.4

Valence 32.7
ZINC 1.21 Gr.
Theory Gram × Per-Cent Cathode Efficiency = Actual Metal Deposited
ELECTRO-CHEMICAL EQUIVALENT

Amps.	MINUTES.											
	5	10	15	20	25	30	35	40	45	50	55	60
1	.101	.201	.302	.403	.504	.605	.706	.806	.907	1.008	1.109	1.21
2	.201	.403	.605	.806	1.008	1.21	1.41	1.61	1.81	2.016	2.21	2.42
3	.302	.605	.907	1.21	1.51	1.81	2.11	2.42	2.72	3.02	3.32	3.63
4	.403	.806	1.21	1.61	2.01	2.42	2.82	3.22	3.63	4.03	4.43	4.84
5	.504	1.008	1.51	2.01	2.52	3.02	3.52	4.03	4.53	5.04	5.54	6.04
10	1.008	2.016	3.02	4.03	5.04	6.04	7.05	8.06	9.07	10.08	11.08	12.09
15	1.51	3.02	4.53	6.04	7.56	9.07	10.5	12.9	13.6	15.1	16.6	18.1
20	2.01	4.03	6.04	8.06	10.08	12.09	14.1	16.1	18.1	20.1	22.1	24.1
25	2.52	5.04	7.56	10.08	12.6	15.1	17.6	20.1	22.6	25.2	27.7	30.2
30	3.02	6.04	9.07	12.09	15.1	18.1	21.1	24.1	27.2	30.2	33.2	36.2
35	3.52	7.05	10.58	14.1	17.6	21.1	24.6	28.2	31.7	35.2	38.8	42.3
40	4.03	8.06	12.09	16.1	20.1	24.1	28.2	32.2	36.2	40.3	44.3	48.3
45	4.53	9.07	13.6	18.1	22.6	27.2	31.7	36.2	40.8	45.3	49.8	54.4
50	5.04	10.08	15.1	20.1	25.2	30.2	35.2	40.3	45.3	50.4	55.4	60.4
55	5.54	11.08	16.6	22.1	27.7	33.2	38.8	44.3	49.8	55.4	6.09	66.5
60	6.04	12.09	18.1	24.1	30.2	36.2	42.3	48.3	54.4	60.4	66.5	72.5
65	6.55	13.1	19.6	26.2	32.7	39.3	45.8	52.4	58.9	65.5	72.07	78.6
70	7.05	14.1	21.1	28.2	35.2	42.3	49.3	56.4	63.5	70.5	77.6	84.6
75	7.56	15.1	22.6	30.2	37.8	45.3	52.9	60.4	68.04	75.6	83.1	90.7
80	8.06	16.1	24.1	32.2	40.3	48.3	56.4	64.5	72.5	80.6	88.7	96.7
85	8.56	17.1	25.7	34.2	42.8	51.4	59.9	68.5	77.1	85.6	94.2	10.28
90	9.07	18.1	27.2	36.2	45.3	54.4	63.5	72.5	81.6	90.7	99.7	108.8
95	9.57	19.1	28.7	38.3	47.8	57.4	67.03	76.6	86.1	95.7	105.3	114.9
100	10.08	20.1	30.2	40.3	50.4	60.4	70.5	80.6	90.7	100.8	110.8	120.9

pends not only upon the current, but also upon the metal, i. e., if a quantity of current is passed successively through solutions of silver, copper, gold and nickel, the weight of each metal deposited will bear the same ratio to the others as their respective electro-chemical equivalents, also that the weight of any metal liberated in electro-chemical action depends not only on its atomic weight, but also on its valence.

The instruments and methods for this calculation are several; the voltmeter and ammeter and the foot rule are usually sufficient for common shop practice. For more accurate work, however, these instruments cannot be depended upon, because of lack of uniformity of speed and temperature conditions; therefore, for testing purposes we must resort to the use of the Coulomb meter, or ampere-hour meter.

The theory of this method of measurement which comes under Faraday's law, may be found in any authentic work on electrolysis. A meter of this kind can be arranged by dissolving: Water, 100 c. c.; sulphate of copper, 17.3 grams; sulphuric acid (c. p.), 5 grams; alcohol, 7.5 c. c., in distilled water, and placed in series with the solution to be tested. A convenient sample of solution, we'll say, for each would be a liter or 1 quart. This is then placed in the circuit, with the Coulomb meter, preferably in a d. c. lighting circuit, where a good steady current is obtainable; lamps must be placed in series in the circuit to give a suitable quantity of current, say .5 or 1 ampere, and the testing cathodes cut to a suitable size to make the number of amperes per square foot desired, the voltage being immaterial. With this instrument, a good balance, and a stop watch, it is possible to work with a degree of accuracy which will satisfy the most accurate conditions, as by weighing the electrodes before and after plating, it is possible to figure the efficiency of the regular plating bath to less than 1 per cent.

"Acid" Cupric "Cu" 1.182 Gr. Valence 31.6 — "Cyanide" Cuprous "Cu" 2.364 Gr. Valence 63.5

COPPER

Theory Gram × Per-Cent Cathode Efficiency = Actual Metal Deposited

ELECTRO-CHEMICAL EQUIVALENT

Cuprous Equals 1.182 x 2

Amps.	MINUTES.											
	5	10	15	20	25	30	35	40	45	50	55	60
1	.098	.197	.29	.39	.49	.59	.68	.78	.88	.98	1.08	1.18
2	.197	.39	.59	.78	.98	1.18	1.37	1.57	1.77	1.97	2.16	2.36
3	.29	.59	.88	1.18	1.47	1.77	2.06	2.36	2.65	2.95	3.25	3.54
4	.39	.78	1.18	1.57	1.97	2.36	2.75	3.15	3.54	3.94	4.33	4.72
5	.49	.98	1.47	1.97	2.46	2.95	3.44	3.94	4.43	4.92	5.41	5.91
10	.98	1.97	2.95	3.94	4.92	5.91	6.89	7.88	8.86	9.85	10.8	11.8
15	1.47	2.95	4.43	5.91	7.38	8.86	10.3	11.8	13.2	14.7	16.2	17.7
20	1.97	3.94	5.91	7.88	9.85	11.8	13.7	15.7	17.7	19.7	21.6	23.6
25	2.46	4.92	7.38	9.85	12.3	14.7	17.2	19.7	22.1	24.6	27.1	29.5
30	2.95	5.91	8.86	11.8	14.7	17.7	20.6	23.6	26.5	29.5	32.5	35.4
35	3.44	6.89	10.3	13.7	17.2	20.6	24.1	27.5	31.1	34.4	37.9	41.3
40	3.94	7.88	11.8	15.7	19.7	23.6	27.5	31.5	35.4	39.4	43.3	47.2
45	4.43	8.86	13.2	17.7	22.1	26.5	31.1	35.4	39.8	44.3	48.7	53.1
50	4.92	9.85	14.7	19.7	24.6	29.5	34.4	39.4	44.3	49.2	54.1	59.1
55	5.41	10.8	16.2	21.6	27.1	32.5	37.9	43.3	48.7	54.1	59.5	65
60	5.91	11.8	17.7	23.6	29.5	35.4	41.3	47.2	53.1	59.1	65	70.9
65	6.4	12.8	19.2	25.6	32.1	38.4	44.8	51.2	57.6	64	70.4	76.8
70	6.89	13.7	20.6	27.5	34.4	41.3	48.2	55.1	62.1	68.9	75.8	82.7
75	7.38	14.7	22.1	29.5	36.9	44.3	51.7	59.1	66.4	73.8	81.2	88.6
80	7.88	15.7	23.6	31.5	39.4	47.2	55.1	63.1	70.9	78.8	86.6	94.5
85	8.37	15.7	25.1	33.4	41.8	50.2	58.6	66.9	75.3	83.7	92.1	100.4
90	8.86	17.7	26.5	35.4	44.3	53.1	62.1	70.9	79.7	88.6	97.5	106.3
95	9.35	18.7	28.1	37.4	46.7	56.1	65.5	74.8	84.2	93.5	102.9	112.2
100	9.85	19.7	29.5	39.4	49.2	59.1	68.9	78.8	88.6	98.5	108.3	118.2

GOLD 113.4 Grains
Or 7.35 Grams
ELECTRO-CHEMICAL EQUIVALENT

Amps.	MINUTES.											
	1	2	3	4	5	10	15	20	25	30	45	60
⅛	.236	.472	.708	.945	1.18	2.36	3.54	4.72	5.9	7.08	10.6	14.1
¼	.472	.945	1.41	1.89	2.36	4.72	7.08	9.45	11.8	14.1	21.2	28.3
⅜	.708	1.41	2.12	2.83	3.54	7.08	10.5	14.1	17.7	21.2	31.8	42.5
½	.945	1.89	2.83	3.78	4.72	9.45	14.1	18.9	23.6	28.3	42.5	56.7
⅝	1.18	2.36	3.54	4.72	5.9	11.8	17.7	23.6	29.5	35.4	53.1	70.8
¾	1.41	2.83	4.25	5.67	7.08	14.1	21.2	28.3	35.4	42.5	63.7	85
⅞	1.65	3.3	4.96	6.61	8.26	16.5	24.8	33	41.3	49.6	74.4	99.2
1	1.89	3.78	5.67	7.56	9.45	18.9	28.3	37.8	47.2	56.7	85	113.4
1¼	2.36	4.72	7.08	9.45	11.8	23.6	35.4	47.2	59	70.8	106.3	141.7
1½	2.83	5.67	8.5	11.3	14.1	28.3	42.5	56.7	70.8	85	127.5	170.1
1¾	3.3	6.61	9.92	13.2	16.5	33	49.5	66.1	82.6	99.2	148.8	198.4
2	3.78	7.56	11.3	15.1	18.9	37.8	56.7	75.6	95.4	113.4	170.1	226.8
3	5.67	11.3	17.1	22.6	28.3	56.7	85	113.4	141.7	170.1	255.1	340.2
4	7.56	15.1	22.6	30.2	37.8	75.6	113.4	151.2	189	226.8	340.2	453.6
5	9.45	18.9	28.3	37.8	47.2	94.5	141.7	189	236.2	283.5	425.2	567
10	18.9	37.8	56.7	75.6	94.5	189	283.5	378	472.5	567	850.5	1134
15	28.3	56.7	85	113.4	141.7	283.5	425.2	567	708.7	850.5	1275	1701
20	37.8	75.6	113.4	151.2	189	378	567	756	945	1134	1701	2268
25	47.2	94.5	141.7	189	236.2	472.5	708.7	945	1181	1417	2126	2835
30	56.7	113.4	170.1	226.8	283.5	567	850.5	1134	1417	1701	2551	3402
35	66.1	132.3	198.4	264.6	330.7	661.5	992.2	1323	1553	1984	2976	3969
40	75.6	151.2	226.8	302.4	378	756	1134	1512	1790	2168	3402	4536
45	85	170.1	255.1	340.2	425.2	850	1275	1701	2026	2451	3827	5103
50	94.5	189	283.5	378	472.5	945	1417	1890	2262	2735	4252	5670

For example, there has been 1.426 grams deposited on the copper cathode; this then multiplied by the valence of nickel, which is 29.5, and divided by the valence of copper, which is 31.6, will give the amount of nickel that should be deposited from the sample tests. The cathode of the test solutions is then weighed; we will say for argument's sake that the nickel cathode has received 1.342 grams deposit. This then multiplied by 100 and divided by what should have been deposited will give the efficiency of the solution, which would be 94.1% efficiency.

After the efficiency of the solution is known, we can then figure the rate of deposition in our regular bath by the time and ammeter according to the electro-chemical equivalents of the particular metal deposited, and the efficiency of the bath.

The rate of deposition can thus be determined which is best for certain classes of work per square inch. It is understood that in order to work a system of this kind it is necessary to have an ammeter in the circuit and a rheostat that will give proper regulation or adjustment of current, this then, when the rheostat is set and the reading of the ammeter is where it is desired, and the number of square inches or square feet is known, the article is left to run the number of ampere hours required. A little study and practice will soon enable the plater to govern the rate of the deposition. Suppose it is desired to deposit a certain number of grams of zinc to the square foot: we would consult the table of electrochemical equivalents and note that 5 amperes in 1 hour, or in electrical terms, in 5 ampere hours, there will be deposited 6.04 grams of zinc, consequently, 100 amperes in one hour, or 100 ampere hours, there should be deposited twenty times as much, or 120.9 grams, providing the bath is working at 100% efficiency, a condition which almost never occurs. We have seen from the figures, from our Coulomb meter, that that particular solution gave us 94% cathode efficiency; we must,

therefore, multiply the figures from our table by the cathode efficiency of the bath. This will give the actual amount of metal deposited for the load. The load must be compared with the total number of square feet, say 10 square feet, in the batch, then divide the total weight of actual metal deposited, which divided by 144 square inches contained in one square foot, approximately .084 grams per square inch on one side, and this may be taken as a standard.

The electrochemical equivalent of nickel being 1.085 grams per ampere hour, it is desired to deposit, say for instance, 28.3 grams of nickel to the square foot (this is equal to 1 oz.); it will be found that 26 amperes in one hour would be necessary, fractions eliminated, and in 45 minutes would require approximately 33 amperes, and so on.

An acid solution being a cupric salt, valence 31.6, electrochemical equivalent 1.185 grams; a cyanide copper solution being a cuprous salt, valence 63, electrochemical equivalent is just twice as much, or 2.370 grams. This, then, would apparently be the proper solution, to be used, but as it is more expensive solution, due to its composition from the chemicals involved and results obtained, and as we cannot operate the same as at high an amperage without serious results, unless perhaps, when operated at a high temperature, other factors then being involved, the acid solution is therefore generally used for heavy deposits. Electrotypers especially make use of acid solution in electrotyping, because of its economy and efficiency.

Brass solutions may offer some objections, inasmuch as there are two metals to be considered, yet if an analysis of the deposit be made and the content of each metal be known, and the color of the deposit noted, temperature and also the current used in the bath before the analysis, it will be found that a certain amount of copper and zinc was deposited under those conditions,

for example, 35% zinc, 65% copper, was deposited, the electrochemical equivalent of the zinc is 1.21, of which 35% was deposited, and of cuprous, which is 2.36, of which 65% was deposited; some special study, however, would be necessary to work out a system of this kind.

These figures apply to the actual cathode efficiency only, but by subtracting the anode efficiency from the cathode efficiency, will give the amount of metal the solution loses.

On the other hand, if the cathode efficiency is low, as in a hot copper bath the amount of anode efficiency is likely to be correspondingly high, due to the large amount of free cyanide present. In this case, the anode figures would be the larger, the cathode figures would be subtracted therefrom and would represent the amount of metal that the solution gained.

With application of these figures it would be quite possible to keep a very accurate account of the metallic condition of the bath as well as the amount of metal deposited on the cathode.

Along the same lines, the thickness of a deposit may be calculated, but is somewhat complicated and not always accurate, as the rate of deposition may be heavier at the points of least resistance of the article. A good practice is to take a thin sheet of metal that is of as accurate size as is at hand, then make a small cross or mark with a scratch awl or pointed instrument, and, being careful not to abraise, the surface is then measured with a micrometer and the reading taken; this can be done on several places of the surface and noted. It is then plated, the small lines or crosses will then be noticeable and measured again. The first reading is then subtracted and the result noted; for instance, the first reading is 5.6th second reading 6.4th, the difference is 8 10-thousandths.

The following tables have been compiled, showing a range from 1 to 100 ampere hours. Silver is also given in grams as well as grains, and will be found a ready means of computation.

EXPOSURE TESTS OF PLATING ON NON-FERROUS METALS

Schedule of Inspections

1—SCHEDULE

Key West—10:00 A.M. Wednesday

Notify L. M. Pierce, U. S. Naval Station, Key West, Fla.
1936—June 17, August 19, October 21,
1937—January 20, April 21.

New York City—1:30 P.M. Thursday

Notify C. L. Hippensteel, 463 West Street, New York City.
1936—July 16, September 17, November 19,
1937—February 18, May 20.

Pittsburgh, Pa.—10:00 A.M. Saturday

Notify S. E. Hedden, 227 Fifth St., Aspinwall, Pa.
1936—July 25, September 26, November 14,
1937—February 27, May 15.

Sandy Hook, N. J.—10:00 A.M. Friday

Notify C. L. Hippensteel, 463 West St., New York City.
1936—July 17, September 18, November 20,
1937—February 19, May 21.

State College, Pa.—1:00 P.M. Friday

Notify G. C. Chandlee, Chemistry Dept., State College, Pa.
1936—July 24, September 25, November 13,
1937—February 26, May 14.

Washington, D. C.—10:00 A.M. Wednesday

Notify W. Blum, National Bureau of Standards, Washington, D. C.
1936—July 8, September 9, November 11,
1937—February 10, May 12.

2—ARRANGEMENTS

The above schedule for the inspection of the plated specimens is necessarily tentative, and subject to change in the light of local conditions. Persons planning to take part in such inspections are therefore requested to communicate in advance with the person designated for each location, so that details or changes may be explained.

It is hoped that each member of the Joint Committee on Exposure Tests of Non-Ferrous Metals will arrange to be present at many of the inspections, and in addition will designate an alternate to represent him in his absence. Any other interested persons are welcome to attend and take part in these inspections. Representatives from the American Electro-Platers' Society; American Society for Testing Materials, and contributing manufacturers are especially desired, in order that in the observations and interpretations their experience may be utilized.

3—BASIS OF INSPECTION

The composition of each coating is stated in the report of the Joint Committee, printed by both the A. E. S. and A. S. T. M. The order of the specimens is designated on the racks and in the folders that will be used for recording the inspections.

Until further notice, the condition of the specimens will be recorded as follows:

(a) *Steel and Iron*—On the specimens retained from the first exposure tests, and on the new specimens from S-1 to I-4 inclusive, a numerical rating based on the percentage of rust will be used, with the same scale as was previously employed.

% Rust	*Rating*
None	5
0— 5	4
5— 10	3
10— 20	2
20— 50	1
50—100	0

In addition, the extent of any other defects such as stains, blisters, and peeling, will be noted.

(b) *Non-Ferrous Metals*—On all the other specimens, including those few that are unplated, the appearance will be concisely stated, with, where feasible, an estimate of the percentage area of any defect. To facilitate compilation, it is suggested that this percentage be expressed in intervals of 1 percent from 0 to 5 percent, of 5 percent from 5 to 20 percent, and of 10 percent for the remainder. For example a specimen might be recorded as follows:

Large blisters..... 3%
Dark stains.....15%
White stains.....30%

It is hoped that after such observations have been made at a few inspections in each location, a simple numerical system for weighting these observations can be devised. In due time a conference on this subject will be held.

Dangerous Electrical Wiring

From The Travelers Standard

In razing old buildings and in making extensive interior alterations, marked differences are commonly observed between the methods of wiring employed (say) twenty-five years ago and those that are approved today. In many respects the earlier wiring fails to conform with the requirements of the National Electrical Code now in effect, and similar wiring methods would not be approved by local inspection authorities if they were used in new installations. Nevertheless, these wiring systems have proved satisfactory during a considerable period, and it is probable that if they had been allowed to remain undisturbed they would have given good service for many years to come, provided the original installations had been made in accordance with the best methods known at the time.

However, a good deal of wiring was done by amateurs, in the days before the licensing of electricians was required, which was neither mechanically acceptable nor electrically safe. As a result of these conditions and of natural deterioration, many of these installations may now be considered as serious fire hazards. Furthermore, certain methods, devices, and items of equipment, although the best available at the time, were never wholly safe. Some of them caused trouble even with the then relatively limited use of electric current, and the continued use of them under modern conditions seems likely to lead to serious disaster.

For the protection of life and property every owner of a building should make sure that it contains none of the dangerous wiring or equipment that was more or less typical of the earlier installations to which we have referred. This may be done by arranging for an inspection by a competent electrical engineer and by authorizing him to make all alterations and replacements that may be necessary. Some of the hazardous features of the older wiring installations are as follows:

1. Wiring in wooden molding which was originally secured to walls and ceilings, in plain view, but which, subsequently, was concealed as the result of building alterations or remodeling.

2. Wiring on porcelain cleats, "open" when installed but later inclosed during the process of reconstruction.

3. Wiring supported on wooden cleats.

4. Wiring, supported by knobs or cleats, which was not drawn tight at the start and which has sagged still more and come in contact with structural parts of the building.

5. Wiring in flexible loom into which nails and screws may have been driven.

6. Armored cable or iron conduit that was not properly bushed at the entrances to outlet boxes, when installed.

7. Conduits and armored cables that have corroded to such an extent that the mechanical strength has been reduced or that moisture has entered and caused deterioration of the wiring and insulation.

8. Unsoldered joints in wiring, protected only by inflammable friction tape, which may have become loosened in consequence of vibration of the building or from some other cause.

9. Cotton-covered lamp cord originally used for extension lights but later connected to devices requiring current in excess of the cord's capacity.

In addition to improper wiring there may be unsafe devices and equipment. Some of them are: old style open or link fuses which are not only dangerous from the personal-injury standpoint but which may also be considered as fire hazards; porcelain fused rosettes, and open knife switches not mounted on suitable switch-boards, which are similarly hazardous; and brass-shell sockets and switches which may become damp in consequence of local atmospheric conditions, or which may be operated by persons with moist hands or standing on wet floors.

Modern safe practice requires the grounding of all electrical-utilization equipment; such as motors, transformers, and portable electric tools and appliances. Many of those of earlier types were not grounded and are dangerous where still in use.

Finally, the serious present-day hazard of the ignition of dust, vapors from volatile liquids, and highly inflammable materials in general, requires the removal of arc lamps, circuit breakers of the air-break type or having magnetic blow-out coils, and all other arc and spark producing devices and equipment, from locations where these dangerous substances may be present.

The Convention of 1936

The Convention of 1936 is past, and it was one of the "best" ever held. The spirit of good fellowshlp was never more expressed in any previous convention or felt by every one who attended.

The Monday Evening "Fellowship Club" is very much responsible for this as it gets everybody who attends this "party" acquainted the first evening of the Convention. Those who did not get to attend this party missed much. Therefore it should be the endeavor of everyone who expects to attend the next convention to get there before this party is held in order to get the real spirit of "Good Fellowship." The slogan was everybody make themselves acquainted with his neighbor, and if any one should take offence he or she should be reported to the Committee and then the Committee would attend to them forthwith.

The program, both educational and entertaining, was "A-1" par excellence. Cleveland Branch is to be congratulated on having so successful a convention, and ideal weather throughout the entire four days—not too hot or cold—just good convention weather.

The manufacturers' and supply houses' exhibits were good and very well attended.

The platers' exhibit was not so well representative of what it should have been as I was chairman of the judges for the award of prizes for the branch and individual exhibits, I had of course to see them and I am sorry to say that only two Branches had an exhibit, Bridgeport and Cleveland being the two. I wish to repeat in part what I said when I made the awards after the banquet Thursday evening, June 4.

I am a little ashamed of representative exhibits at this convention being so few and also that the convention is principally

to further the advancement of the art of electro-deposition of metals, and the branch and individual exhibits are for them to compete for prizes, but not only for the prize—no—but in order that the work or wares of the individual plater may be seen by those attending the convention, and the group or branch exhibit idea is to create an interest in the branches to get up a real exhibit. Will the branches therefore start *now* to prepare for an exhibit for the convention in New York City next June?

Bridgeport Branch was awarded the Gold Cup put up by the Metal Industry, and they won it last year. If they win it again next year it belongs to them. Now the idea of the cup was and is to create an interest among the branches to try and win that cup. Should Bridgeport Branch win it again there will have to be another one put up. Now let's see some other Branch get that cup next year and keep it in circulation.

It has been stated and published that Cleveland Convention broke all records for registrations and attendance. Cleveland did have a real good attendance and registration but it did not break or make any record, as the convention held in Detroit in 1929 was and is the record convention—it had 724 registrations. Detroit did not have any slogan except one of their very own for the 1934 Convention and that was not broadcast. It was held in committee: "We must make it a success, in every way, so let's show them." And did Detroit show them? I believe they did, and it was from that time on that every convention has grown in interest. The attendance however still stands for the 1929 record of 724.

Exhibits are to be taboo or in other words "out" so far as the Society is concerned for a 5-year period. We (Detroit) started the 1929 Convention without the exhibits and for 5 years after there were no manufacturers' exhibits connected with the Society Convention, and I know there have been no conventions that did not have any exhibits that lost any money thereby.

The principle reason for not having any more manufacturers' exhibits for a 5-year period is that a majority of the larger manufacturers and supply houses did not care for it.

Now that we have passed the amendment to the Constitution creating a full time Secretary-Treasurer-Editor, I am sure that some of our worries and cares will be absorbed by this officer, and I am expecting great things in the near future to come from this office.

Detroit Branch and the city of Detroit were well represented in the number of attendants, there being approximately eighty men and women from its environs present.

Detroit Branch wishes to congratulate New York City upon being chosen the Convention City for 1937, and is assured that New York Branch will put up as good a convention as any other city has. Milwaukee made a very good attempt for it, but on account of custom the convention was due east. Milwaukee will have a better opportunity for 1938 as it should go West then.

Detroit Branch wishes the newly elected officers to know that it is standing by for any assistance it may be called upon to render.

T. C. EICHSTAEDT.

1936 CONVENTION REPORTS

Owing to the increased cost of printing the proceedings of the Convention in the last few years, it has been voted at the Cleveland Convention to increase the price of these copies from three to five dollars each.

Because of the many photos used and the number of papers presented at the Educational Sessions in recent years, the Society has had a deficit on their hands when the reports were printed and mailed. Branch Societies and all others wishing copies should communicate at once with the Executive Secretary, Wm. J. R. Kennedy, 90 Maynard St., Springfield, Mass., as the Convention Reports will soon be received from the publisher.

LISTEN TO THIS, PLATERS!

Our old friend, "Liquid Sulphur Mac", President of Sulphur Products Co., Inc., of Greensburg, Pa., has just announced that he is putting a new product on the market.

"FOOT JOY" is the name.....and when it comes to giving quick, lasting relief to all those folks who are suffering from tired, tender, odorous, perspiring feet.....FOOT JOY is all that its name implies.

Yes, and here's another thing — anyone who is bothered with that quite common foot irritation widely known as "Athlete's Foot", will, without question, be pleasantly surprised at the wonderful results obtained by fighting this foot-enemy with FOOT JOY.

Easy to use....and sure to give the user a pleasant surprise with its quick, sure results. Just pour a little FOOT JOY in your evening foot-bath, bathe your feet as usual....and....foot-relief is yours.

BOSTON BRANCH — AMERICAN ELECTRO-PLATERS' SOCIETY

First Annual Outing

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TIME: ALL DAY — Easy to get to by boat or car.
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ANNOUNCEMENT

Mr. William M. Phillips, who has been chairman of the Research Committee for several years, has consented to head the work of this committee for another year at the request of President E. Steen Thompson.

We are pleased to make this announcement, as Mr. Phillips has not only done much to bring the Research Department into prominence, but has helped the whole society by appearing as a speaker before many of our branches and at the Educational Sessions of the convention where on several occasions he has been the presiding officer.

Plan now for the
1937 · CONVENTION
in New York

For Information write to

Franklyn J. MacStoker

General Chairman

25 Princeton Street, Garden City, L. I.

The Abstract Section

JAMES W. HANLON, *Chairman, Program and Educational Committee*

The Electrodeposition of Maganese from Aqueous Solutions. I.—Chloride Electrolytes. H. H. OAKS and W. E. BRADT. *Trans. Electrochem. Soc.* Preprint, **69,** 1936—Smooth, silvery white deposits of manganese were deposited from a bath containing 40 to 53 oz/gal of manganous chloride, $MnCl_2 4H_2O$, and 4 oz/gal of ammonium chloride, at 190 amp/ft^2. The bath was at room temperature and was vigorously stirred. The anode of commercial (96%) manganese was placed inside a porous pot. W. BLUM.

Nickel-Cobalt Alloy Plating from Acid Sulphate Solution. C. B. F. YOUNG and N. A. GOULD. *Trans. Electrochem. Soc.* Preprint, **69,** 1936—The deposits were produced in a bath containing 26 oz/gal nickel sulphate ($NiSO_4.7H_2O$), 4.7 oz/gal cobalt sulphate ($CoSO_4.7H_2O$), 2 oz/gal sodium chloride, and 3.3 oz/gal boric acid, at a pH of 5.5 to 5.8, and current densities of 10 to 30 amp/ft. The content of cobalt in the deposit is increased by increasing the temperature, the agitation and the current density. Addition of gelatin produced brighter deposits. W. BLUM.

Anodic Pickling of Iron and Steel. R. MUELLER and L. HARANT. *Trans. Electrochem. Soc.* preprint, **69,** 1936—A solution containing 8 oz/gal of ferrous sulphate ($FeSO_4.7H_2O$) and from 0.2 to 0.7 oz/gal of sulphuric acid is recommended for pickling iron and steel at 75°C to 95°F with an anode current density of 5 to 9 amp/ft^2. It is claimed that this is more efficient and more economical than direct pickling in 10 percent sulphuric acid. W. BLUM.

METAL CLEANING AND FINISHING

April, 1936

Grinding and Polishing of Pocket Knives, by FRED B. JACOBS—The various operations of grinding, polishing and buffing are described in detail. Semi-automatic processes have replaced hand polishing to some extent. It is of interest to note that the majority of sequences are performed with the wheel turning away, rather than toward the polisher. Although this method is slower, more accurate work is possible. E. T. SHEEHAN

Bright Zinc Plating, by R. O. HULL—Tests have indicated that in many respects zinc is equal, if not superior, to cadmium. However, in view of its limitations, it is doubtful that it will supplant cadmium. Rather, it will

find fields of application entirely its own. The article compares cadmium and zinc from various viewpoints. Most important of these are: color, brightness, permanence of luster, resistance to tarnish and stain hardness, and electrochemical qualities. Constituents, concentrations employed and the relationship of these factors in the bright zinc bath are described very thoroughly. E. T. SHEEHAN.

Roll of Films in the Electrodeposition of Metals: A Correlated Abstract. W. R. MEYER. *Metals & Alloys*, page 123, May, 1936—Article discusses findings of ten years of study done by authorities on films in relation to electrodeposition of metals. It is divided into three sections (1) formation and structure of films (2) description of effects of these films on the adhesion, crystal structure and coverage of the deposit (3) review of films artificially prepared upon electrodeposit itself. The article correlates in brief the major work done on these topics and affords an excellent reference as well as a summary on films. PHIL. J. RITZENTHALER.

Electroplating Industry Keeps Pace with Modernization Movement. C. W. YERGER. *Steel*, Vol. **98**, Jan. 1936, p. 54—Recent developments in electroplating have tended to eliminate the human factor and to obtain more uniform and better plating throughout. Bright nickel, bright zinc deposits have been developed and production has been increased and improved by use of higher current densities. PHIL. J. RITZENTHALER

Mechanism of Brass Plating. C. B. F. YOUNG. *Steel*, Vol. **97**, Dec. 23, 1935—In brass plating it is necessary to have the normal cathode potentials of Cu and Zn equal or nearly so in order to plate two simultaneously. By forming double cyanides, potential of Cu is reduced much faster than zinc until they become equal. To deposit the same alloy bath composition must remain the same. Increase of free cyanide content decreases copper in brass. Increase in current density increases zinc in alloy. Increase in temperature increases copper in alloy. pH of bath should be about 11. Indicator to use = 0.6 g thymolphthalein and 0.1 g phenolphthalein in 300 cc. ethyl alcohol. PHIL J. RITZENTHALER.

METAL CLEANING AND FINISHING

Deposition of Nickel—Cobalt Alloys from Solutions Containing Triethanolamine. By C. J. BROCKMAN and J. P. NOWLEN—The use of triethanolamine makes available an alkaline bath for the deposition of cobalt-nickel alloys. Deposits of this nature are more resistant to corrosion than

nickel or cobalt alone. Current densities employed were from 32 to 144 amperes per sq. ft. Solution was approximately room temperature. Percentage of cobalt in the electrolyte, temperature and current density, are factors governing the percentage of cobalt in the alloy deposited.

E. T. SHEEHAN

Inhibitors—Safe and Dangerous, by VLICK A. EVANS, Cambridge Univ., Cambridge, England—Preliminary consideration is given to the corrosion of metals in various solutions. Anodic and cathodic products may, under various circumstances, either aid or suppress electrolytic action. The controlling factor in the corrosion of a metal may be largely anodic or cathodic, although mixed control is more usual. Inhibitors are classified as anodic or cathodic in reaction. Accordingly, then, four modes of inhibition are discussed:

1. Anodic control—Anodic inhibitor
2. " " —Cathodic inhibitor
3. Cathodic control—Anodic "
4. " " —Cathodic "

Particular attention is accorded to the benefits or dangers accompanying the reaction, under each type.

E. T. SHEEHAN

METALS AND ALLOYS—ABSTRACTS

PHIL J. RITZENTHALER

1. Current methods for Treatment of Metal Surfaces, *Steel*, Vol. **98**, Mar. 2, 1936, pp. **34, 57**—Article describes briefly:

(a) Electrolytic cleaning of ferrous metals in sodium carbonate or sodium phosphate.

(b) Electrolytic scale removal in acid and alkaline baths with deposition of Ph or Sn.

(c) Electrolytic pickling first at cathode then anode in 25-75% H_2SO_4.

(d) Formation of protective film of $Znz(PO_4)_2$ by electrolysis.

(e) Formation of phosphate film on cadmium or zinc.

2. Metal Finishing Advances in 1935, SIMONDS. *Iron Age*, Vol. **137,** Jan. 2, 1936, pp. 553-4—Discusses practical applications of laboratory

developments during past year. They include Al coating of steel, bright nickel plating, chemical black coating, plating on plastics, improved enamels and lacquers. Includes comments from many authorities.

3. **Inhibitors.** K. B. LEWIS. *Wire and Wire Products*, Vol. **11,** March, 1936, pp. 127-9—The action and types of inhibitors in wire drawing are discussed together with experimental study of qualities of an inhibitor. It was found that inhibitor acts differently on the different constituents of a steel. Two general classes are noted, (1) low carbon basic steel rod and spherodized steel, and (2) patented rod, high strip and medium C as rolled. An inhibitor satisfactory for one class is, in general, not satisfactory for another. Mixture of bath is not satisfactory.

4. **Finishing Aluminum with Abrasives.** H. K. WORK. *Abrasive Industry*, Vol. **17,** Feb. 1936, pp. 8-11—Difference in polishing technique for Al from that of other metals is discussed. Wheels are softer and finer abrasives used. Procedure is sketched and typical polishing operations for various Al products are given. Welded Aluminum parts to be anodized have welded areas blended by polishing after annealing. Production of high luster and colors are discussed.

5. **Roll Grinding.** J. R. Leonard. *Wire and Wire Products*, Vol. **11,** March, 1936, pp. 125-6—Problems occurring in manufacture of highly polished rolls for wire and sheet rolling are discussed. The grinding process coolants and libricants and apparatus are described.

6. **Replenishing the Metal Content of Cyanide Baths.** N. HALL. *Platers' Guide*, Vol. **32,** Feb. 1936, p. 17-18—Free cyanide is one of the determining factors in the maintenance of good throwing power and cyanide must be added with the metal salt to keep cyanide constant. Article contains very useful table for the everyday use of the plater which indicates quantity of cyanide to add with metal salts.

7. **Control of Electroplating.** *Steel*, Vol. **98,** Jan. 1936, pp. 37-8—This article discusses relationship between weight of an electroplated coating and its thickness. It also gives recommended test for porosity and methods for determining thickness of Ni or Ni and Cu, chrome and Ni, and Zn and Sn, Ag and gold coatings on ferrous and non-ferrous metals. It also gives another and more flexible porosity test.

Business and Social News

BRANCH NEWS

Educational Activities

AMERICAN ELECTRO-PLATERS' SOCIETY

ROCHESTER BRANCH

The regular monthly meeting of the Rochester Branch was held on Friday night, May 15th, at the Seneca Hotel. Meeting called to order by President Kohlmeier. Minutes of previous meeting read and approved as read. Communication read. Comments. Delegates to use own judgment in regard to amendments and as to convention city for 1937. Secretary ordered to pay per capita tax. Committee in charge of Fish Fry then made its report. All bills were ordered paid and then the committee was dismissed with a rising vote of thanks for a grand party. Mr. J. Dutton and Mr. A. Moore were then elected as associate members. President Kohlmeier then appointed the following men as delegates and alternates to the convention:

Delegates: S. P. Gartland, R. O. Warner, F. J. Kohlmeier; *Alternates*, Chas. Burnett, John Honnecker, Ray DelRosso.

The election of officers was the next order of business and the following were nominated:

*P*resident, F. J. Kohlmeier; *Vice-President*, Chas. Hehr; *Sec.-Treas.*, J. R. Elster; *Librarian*, J. Snyder; *Board of Managers*, C. O. Fields, S. P. Gartland, R. L. DelRosso.

As there were no other nominations the secretary was ordered to cast one ballot for all nominees. So carried.

President Kohlmeier then appointed Mr. John Honnecker as Educational Chairman for the coming year.

The talk then turned to the Upper New York State Convention to be held at Syracuse in conjunction with the Binghamton Branch in the early part of July and Mr. Ray Berghold was appointed to take care of transportation and to work with the rest of the committee consisting of Mr. H. Norgren representing the Rochester Branch and Mr. A. Fletcher from the Binghamton Branch. We are planning on making this a real affair and hope to have a large turnout.

JUDSON R. ELSTER, *Sec.*

NEWARK BRANCH

The regular meeting of the Newark Branch A. E. S. was held on Friday evening, May 1, at the Hotel Douglas, Hill Street, Newark. The meeting was called to order at 8 P. M. by President Samuel Taylor. The following officers were present: Samuel Taylor, president; John Kotches, vice-president; George Wagner, secretary; Nelson Sievering, treasurer; Cyril Hamlin and Sam Glichenhaus, trustees. The minutes of the previous meeting were read and approved.

Mr. Smith, chairman of the banquet committee reported that the banquet was a huge success both socially and financially and stated that the Bingo games at the banquet were greatly enjoyed by all who were present. Mr. Smith was given a vote of applause for his interest and sincerity in handling our annual affair.

The Newark Branch elected the following delegates to the convention which is scheduled to be held at Cleveland beginning Monday June 1, are: Mr. Horace Smith, Mr. Nelson Siever-

ing, and Mr. Cyril Hamlin. The following members were elected as alternates: Mr. Robert Sinclair, Mr. Philip Sievering, and Mr. Samuel Taylor. The meeting adjourned at 10:30 P. M.

The regular meeting of the Newark Branch A. E. S. was held on Friday evening, May 15, 8:30 at the Hotel Douglas, the President Samuel Taylor presiding. The following officers were present: Samuel Taylor, president; George Wagner, secretary; Nelson Sievering, treasurer; George Klink, sargeant-at-arms; Samuel Glichenhaus, trustee. The minutes of the previous meeting were read and approved.

A letter was read from Bert Sage in which he mentioned a lot of activities in the newly organized Boston Branch. Mr. Sage asked for a transfer to the Boston Branch and it was voted that the transfer be granted. It was also voted that the Newark Branch should have only one meeting per month in July and August and that the meeting would be the third Friday of each of these two months.

The chair then proceeded to the election of officers for the year 1936-37, the following officers were elected: President Samuel Taylor; Vice-President, John Kotches; Secretary, George Wagner; Treasurer, Nelson Sievering; Sargeant-at-arms, Geo. Klink; Trustees Samuel Glickenhaus, Cyril Hamlin, and William Hodecker. The speaker for the evening was Mr. William Voss who gave a very interesting talk on his experiences in solving problems in different plating rooms. Mr. Voss had the attention of the Branch for over an hour. Some of his stories were very amusing and he was given a vote of thanks for his talk. Meeting adjourned at 10:30 P. M.

GEORGE WAGNER, *Sec.*

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WATERBURY BRANCH

Waterbury Branch, A. E. S., held a short session Friday evening, June 12th, at which time the transfer card of C. R. Prescott of Hartford Branch was received. Favorable action was also taken on the application of George A. Colombie, of Torrington, Conn. The principle topic discussed at the gathering was the recent A. E. S. Convention held in Cleveland, Ohio, and which was attended by about twenty people from this city.

WM. F. GUILFOILE, *Sec.*

ANDERSON BRANCH

Anderson Branch held its monthly dinner meeting at the Y. M. C. A. on June 8th. There were twenty members present including all the officers. After dinner, the meeting was called to

order by our new president, James Minton.

The retiring treasurer made a report of his year's activities to the Board of Managers. The applications of Mr. Roy Shockley and Mr. John Fredrick were received and discussed. Both were unanimously accepted. A third application was tabled for future action pending investigation.

The meeting was then turned over to our convention delegates, Robert Wagner and William Castell, who gave a very interesting report on the papers presented and inspection trips to nearby industrial and chemical plants. Anderson Branch is particularly proud of the way the convention received the paper of our Dr. D. A. Cotton and the fact that he was awarded a gold medal for having the best paper at the 1935 convention. It is planned to have Dr. Cotton present his last paper to the local Branch at a future meeting.

Our next meeting is scheduled for June 22nd. Mr. Castell has volunteered to resume his services as discussion leader on various phases of plating.

Meeting adjourned at 9:00 P. M.

L. R. HINSCH, *Sec.*

LOS ANGELES BRANCH

Minutes of the regular monthly meeting of the Los Angeles Branch A. E. S., held May 13th, 1936, at the Rosslyn Hotel. President E. R. Williams presided.

Minutes and financial report of the previous meeting were read and accepted.

Bills for $42.53 were read and ordered paid.

The secretary was instructed to write all supply houses doing business in this territory and extend an invitation to their representatives who may be visiting this section of the country to attend one of our meetings while here.

It was suggested that we have an open meeting in October at which time we have a good display of plated work. The question was left open to be decided at the next meeting.

Next came election of officers. The old officers were all unanimously re-elected for the year 1936-37.

In the absence of Ray Bray, Harry Garside acted as librarian. The following questions were discussed:

Q. Does anyone know anything about laminated chrome plating? That is plating one plate of chrome on top of another.

A. This brought out a lot of discussion. It was suggested that it might be well to strike the work with reverse current for just an instant before the second plate is applied. Also it was suggested that the final finish would be better if a trifle less current was used when plating the second time then when the first coat was applied.

Q. How can a bronze solution be converted to a yellow brass?

A. If the bronze solution contains no other metal except copper and zinc, just add enough zinc cyanide to give it the desired color.

In discussing this question it was brought out incidentally that a very small amount of cadmium added to a bronze solution gave it a better bronze color.

Q. What causes spotting out on brass, either solid or plated, after it has been lacquered?

A. This is frequently caused by the cleaner used. Try cleaning with scratch brush and water instead of cleaner. May be caused by the lacquer. Try some other kind of lacquer.

Mr. Matlin, the chemistry instructor at the Los Angeles High School, was a visitor. He spoke to us a few mo-

ments in an endeavor to interest the Branch in a chemistry class at the high school next fall.

EARL COFFIN, *Sec.-Treas.*

BOSTON BRANCH

Boston Branch held another open meeting Thursday the 11th at the Manger Hotel, Boston, with President Mintie in the Chair.

Supper was served after which the regular order of business proceeded.

Communications and bills were read, moved that they be paid and placed on file.

Fourteen applications were read for the second time and all were elected to membership.

Three applications were received for membership and were turned over to the Board of Managers.

The picnic committee reported that they were working hard to make it a great success and that it will be held at the Pemberton Inn, Hull, Mass., near Nantasket Beach, and that every one attending will have a great time all day, sports for the men, women and children, and a great dinner for all.

The membership committee made its report on the work they are doing and it was accepted as one of progress.

After the regular order of business the Chair was turned over to our Librarian. He stated that Dr. E. K. Strachan of Brown University could not attend because of Commencement Day. In his place the Branch was fortunate in having Mr. Charles S. Barber as the speaker of the evening. His talk was on "The Cleaning of Metals Before Plating". He spoke for about one half an hour covering all the points that are used in the cleaning of metals for plating. He answered all questions for the members and was given a vote of thanks for his very interesting talk.

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Mr. Donald Wood as a delegate to the convention, made a report explaining a little of each talk as he remembered it. He was given a vote of thanks.

Mr. Frank Clark gave the Branch a talk such as the Branch never heard before and it was interesting to the members. His talk was "The Importance of Being a Member of the A. E. S." A vote of thanks was given Mr. Clark for his interesting talk.

We had an unexpected visitor, arriving late but always welcome to Boston Branch—Mr. George B. Hogaboom—just on a visit to the city. He gave the Branch an outline of the convention and what took place there.

We had a little pep talk on the coming picnic and every member present gave his support and took five tickets each to try to sell, saving

two for himself, so that the Branch will have one great time for their friends and families.

The following members were elected to membership at this meeting:

Arthur H. Eriksen, 138 Adams St., Dorchester, Mass.; Charles Hall, 1267 Tremont St., Roxbury, Mass.; Floyd S. Ray, West Newbury, Mass.; Thomas J. Gilmartin, 7 Appleton St., Everett, Mass.; Charles E. Barber, 131 Beverly St., Boston, Mass.; J. Arthur Zimmer, 149 W. Sixth St., South Boston, Mass.; Isadore Baker, 1820 Commonwealth Ave., Boston, Mass.; Laurence Tosi, 81 State St., Cambridge, Mass.; Edward F. Foster, c/o United Carr Fastener Corp., 31 Ames St., Cambridge, Mass.; Thomas Palmer, 30 Evergreen Ave., Wellesley, Mass.; Joseph M. Hauber, 59 Newton Ave., East Braintree, Mass.; William A. Lawrence, 624 Main St., Walpole, Mass.; Herbert J. Quigley, 135 Old Colony Ave., South Boston, Mass.; Wesley Colby, Merrimacport, Mass.

Read for the first time as follows: George A. DeLorme, 101 Reed Ave., Everett, Mass.; Edward R. Grant, 50 Altoona Rd., Dedham, Mass.; Ben R. Raymond, 160 Prescott St., East Boston, Mass.

Meeting adjourned at 11 P. M.

A. W. GARRETT, *Sec.*

MILWAUKEE BRANCH

The regular monthly meeting of Milwaukee Branch was held June 11th, 1936, at Lipps Hall. President Robert Steuernagel presiding. A record attendance for June, 38 present.

We have three applications for membership, Mr. Wm. DeCheck, Mr. John Skeba, Mr. Chas. Unke. These applicants will be initiated at our next regular meeting.

One transfer, Mr. R. F. McQuire, from Chicago Branch. Welcome!

Mr. Jack Geissman, our picnic chairman, reports he and Jake Hay, Chicago Branch picnic chairman, have located an excellent picnic ground at Lake Marie, just about one mile southwest of Antiock, Ill. This location is just about half way between Chicago and Milwaukee. It was suggested the picnic be held about August 16th, just after Chicago and Milwaukee regular monthly meetings.

Our new President, Dexter Rhodes, gave us an excellent report on the convention.

Distinct honors have been bestowed on our own Dan Wittig this month, first when he received word he had been made honorary member of the Supreme Society, and at our own meeting when he was made honorary member of Milwaukee Branch. Dan, we are quite proud of you!

Mr. Ray Goodsell installed the new officers for the coming year. Mr. Dan Wittig acted as Sargeant-at-arms. Following are the officers for 1936-37: President, Dexter Rhodes; Vice-President, Henry Binder; Sec. & Treas., Roman C. Binder; Librarian, Henry Bornitzke; Board of Managers, Jack Geissman, Paul Krause, and John Miszewski, Jr.

Lunch and refreshments followed installation; a good old fashioned song fest topped the evening.

ROMAN C. BINDER, *Sec.-Tresa.*

CHICAGO BRANCH

The regular monthly meeting of Chicago Branch was held June 13, 1936, at the Atlantic Hotel.

Vice-President E. Stepka presided and all other officers were present.

The applications of Mr. F. K. Savage and Mr. C. E. Proudfoot read and committees appointed on same.

Mr. F. J. Hanlon as chairman of the delegates made a very fine and

complete report of the convention.

Mr. O. E. Servis reported that progress was being made on a joint picnic to be held by Chicago and Milwaukee Branches.

Mr. H. G. Stephan's resignation due to retiring from the plating industry, read and accepted.

Mr. R. Meyers a past president of Chicago Branch installed the new officers for the coming year, assisted by Mr. C. Kocour and Mr. J. Mintz. Bob made a very fine job of installing and explained to each of the new officers the duties assigned to them.

It was with deep regret that Chicago Branch officers and members heard of the death of Mr. F. Kellar, a former member of Chicago Branch.

The Librarian found the following questions in the question box.

No. 1. *At what p.H. does nickel hydroxide begin to precipitate when a plating solution is neutralized?*

Ans. p.H. 6.3.

No. 2. *What causes nickel plate to sputter when electric welded? The weld breaks off on some nickel plated parts and not on others.*

Ans. Many suggestions offered but none proved satisfactory.

No. 3. *How can black smut be removed from oil hardened steel parts which cannot be tumbled?*

Ans. One member stated that good results could be had by first cleaning the work and then run in a solution of 75 lbs. Salt, 25 lbs. Sulphuric acid to 100 gals. of water using direct current.

No. 4. *How can spotting out be prevented on cast iron parts plated in cyanide copper solution?*

Ans. One member stated that he was having good results by rinsing in two clean waters and then dipping in a 2% sulphuric acid solution, rinse and dry. Another member stopped the spotting out by leaving the work in the degreasing machine for 5 minutes after plating.

J. W. HANLON, *Sec.*

PHILADELPHIA BRANCH

President Albert Hirsch called meeting of the Philadelphia Branch to order. Minutes of previous meeting read and approved. Roll call of Officers all present. George Brown dropped from the roll. Mr. C. F. Gross transferred to Newark Branch.

Report of Sec. Treas. of the year read, on motion properly seconded report received, spread on the minutes; and a vote of thanks for the able and capable manner the Sec. Treas. fulfilled his duties was carried.

Auditing Committee reported the books of Sec. Treas. in excellent condition submitted their report. Motion properly seconded report be received, and spread on the minutes also committee be discharged with thanks carried.

Delegates reported a very successful convention, President Albert Hirsch gave a resume of the papers read at the convention.

Mr. G. Underwood reported on the business session.

Mr. J. L. Nelson reported on the social activities.

Mr. Nelson was seated as delegate as Mr. P. Uhl being unable to attend. On motion properly seconded, reports of delegates be received with a rising vote of thanks carried. Application of Joseph Raymond received as an active member referred to Board of Managers for approval.

Under good and welfare President Hirsch thanked the members for their hearty co-operation with the Branch Officers for the past year; both by their presence and interest taken in the discussions at the conclusion of

the lectures in Electro-Chemistry that he gave; also in the way the speakers were received and the discussions that followed.

Mr. George Gehling deeply thanks the member of the Philadelphia Branch in their response and hearty co-operation in helping him have the excellent report on the Branch standing at the termination of his office; and asked the members to try and have the same pep they had and keep the good work up. For without your help the officers can not make the same showing; as the retiring officers have made.

Past President Mr. George Long then installed the newly elected Officers and instructed them as to their duties of their office.

The Officers installed were as follows.

President, Albert Hirsch; Vice-President, George Underwood; Secretary-Treasurer, R. E. Jackson, Jr.; Librarian, J. L. Nelson; Board of Managers, George Gehling, Harry Snyder, Phillip Uhl.

There being no more business the meeting was adjourned until September 18th, 1936. And the Board of Officers to continue to hold meetings at the call of the President during the months of July and August. Attendance 28. ROBERT E. JACKSON, JR. *Sec-Treas.*

TOLEDO BRANCH

The following platers were elected to membership in our branch at our last regular meeting.

Joseph Di Salle 223 Fearing Blvd., Toledo, O., Active member; Carlton C. Mitchell, 6823 Maplewood St., Sylvania, Ohio, Associate member; Robert Hilfinger, 1617 Dorr St., Toledo, Ohio; Active member. WALTER W. WEIKER, *Sec.*

NEW YORK BRANCH

The Branch held two meetings in June in their rooms at World Bldg., Park Row, New York City.

The first meeting held Friday, June 12th, was a busy one. The calendar was crowded with things to do. The first order of business was a report from the delegates to the Cleveland Convention. The Branch was gratified to learn that the Society had honored New York with the 1937 Convention but were somewhat disappointed in the legislative and resolution enactments passed at the Cleveland meeting, some of the membership so expressing themselves in the after discussion. The installation of the new officers of the Branch forthe ensuing year then took place. Mr. JohnE. Sterling, past Supreme President of the A. E. S., was called upon to perform this duty and he did the job in good fashion. The Roster of New York's officers for 1936-37 is as follows: President, Ralph J. Liguori; Vice-Pres., Henry Levine; Sec'y-Treas. F. J. MacStoker; Recording Sec'y, Henry Painter; Librarian, Aaron Englander; Board of Managers, Justus Stremel, John E. Sterling and Benj. Nadel.

The second meeting, held on Friday, June 26th, was another business session, very well attended, some forty-two members being present on this occasion. The 1937 Convention was uppermost in mind and much discussion relative to it was had. At the conclusion of which Mr. F. J. MacStoker was appointed general chairman of the 1937 Convention Committee, to start his labors forthwith. During the latter part of the meeting the New York membership gave expression to their sense of appreciation of the earnest and untiring efforts of two past presidents of the Branch, Mr. John Rolff, 1933-36, and Mr. Ralph Liguori, 1931-33. On behalf of the membership, Mr. Harry Levine, Vice-President of

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the Branch, presented Mr. Rolff and Mr. Liguori with engraved chain plaquettes bearing the monogram of the A. E. S., as a token of the esteem in which both of these men are held in New York Branch of the A. E. S. The meeting then took on a purely social finale and continued until 11.30 o'clock P. M.

The following applications for membership in the New York Branch, A. E. S., have been received: Mr. Joseph Lerner of the Freedman Sliver Company, Brookly, N. Y. (active); Mr. Charles Favetta, Fidelitone Records, Inc., Astoria, L. I., N. Y. (active); Louis Henry Cates of Enequist Chemical Company, Inc., Brooklyn, N. Y. (associate).

F. J. MacStoker, *Sec.*

NEWARK BRANCH

The regular meeting of the Newark Branch A.E.S. was held on Friday, evening June 19, 1936 at the Kruger Club, Belmont Ave., Newark. Due to the absence of our President and Vice-President the meeting eas called to order by Horace H. Smith at 9 P. M. The following officers were present: George Wagner, Secretary; Neslon Sievering, Treasurer; George Klink, Sargeant-at-Arms; and Cyril Hamling, Samuel Glickenhaus, William Hodecker Trustees.

This being a social meeting the reglar routine of business was dispensed with. The following applications were presented and voted to take the regular course: Armand Fritz Von Hirsh; Edward Royal VanDer Hoef; Gustave Klinkenstein. Installation of Officers was conducted by Mr. Philip Sievering in a very appropriate manner.

New York Branch attended with a delegation and Mr. Frank MacStoker, Secretary of the New York Branch, was called upon for some remarks. He mentioned a great deal about the coming Convention to be held in New York next year and Newark Branch assured him of their cooperation in assisting to make this occassion a success.

The old time spirit prevailed once more at this meeting. At 10:00 P. M. the meeting was adjourned for an evening of pleasure. A Radio had been installed and was tuned in to receive the results of the Louis-Schmelling Bout. The results were received with greate nthusiasm. After that, Moving Pictures were shown of the "Clam Bake" and the "Convention". Following that, there were refreshments and plenty of them. The members finally departed at 1 A. M.

George Wagner, *Sec.*

CLEVELAND BRANCH

The regualr monthly meeting of The American Electro-Platers' Society, Cleveland Branch was held at Hotel Carter Saturday June 20, 1936.

The meeting was called to order by our President Mr. W. D. Scott at 8:15 p. m.

The minutes of the May meeting were approved as read.

Applications for membership in the branch were made by

August Hoffman, 4933 East 111th Street of The Hoffman Plating Company.

Leroy Camel, 5216 Forest Avenue of the Plating and Galvanizing Company.

Washington Shockley, 452 Broadway of the Plating and Galvanizing Company.

Edward Thurston, Sydney, Australia.

The following were elected:

Mr. Florian E. Webber of 1929 East 185th Street, Cleveland Ohio.

Mr. Edward Thurston of 208 St.

50 years of Service

on the most varied and exacting cleaning tests.

KALYE

A heavy duty cleaner that can be used on rough work and on the most delicate of jewelry finishes.

Not the cheapest but sold on its merits.

Send for a free copy of our Kalye manual.

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RUMFORD CHEMICAL WORKS
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REPUTATION

The same care, thought and precision that has earned for New England manufacturers the reputation for craftsmanship — that made **1617** the outstanding Clear Metal Lacquer — will be given to any coating problem you may present to us.

May we serve you ?

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THE STANLEY CHEMICAL COMPANY
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FASTER, BETTER work with

THE BIAS BUFF

—because every thread in every ply of this buff whips the work *all* the time.
—uses less compound.
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We make buffs for every polishing requirement.

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Cutting and Polishing Compounds

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Cutting down, Buffing, Polishing, and Mirror Finishing.

Steel of all kinds including Stainless Steel and Stainless Iron.

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We would like you to get these same good results. Let us help you save money. Full particulars on application.

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Johns Road, Grebe, Sydney, Australia.

Delegates report were accepted.

The resignation of Mr. Matts as librarian was read and due to sickness, begged to be relieved of duty as librarian. Mr. Scott said he would appoint one at our next meeting.

It was regularly moved and seconded that we dispense with our July meeting, carried.

The meeting was then turned over to our convention budget committee and due to the short space of time since the convention, have not had time to make a definite report.

W. E. O'BERG, *Sec-Treas.*

ROCHESTER BRANCH

The Rochester Branch held its regular monthly meeting at the Seneca Hotel on Friday night, June 26. President Kohlmeier called the meeting to order. Regular business was transacted. The chairman in charge of the joint Get-together and Outing of the Rochester and Binghamton Branches, Mr. Henry Norgren, reported that he had obtained reservations at the Three Rivers Inn near Syracuse for July 18th and that everything was going along smoothly for a great time for everybody. The delegates then made their report on the convention which was very glowing. As there was no further business the meeting was adjourned.

JUDSON R. ELSTER, *Sec.*

ANDERSON BRANCH

Anderson Branch held an educational session, June 29th at the local Y. M. C. A. The thirteen members present were called to order by President James Minton. As the evening was unusually hot, the meeting was confined to a brief discussion of the basic reasons for plating such as corrosion resistance, decorative finish, electrotyping, refining, wear resistance and increasing dimensions. This was followed by an explanation and discussion of the electrochemical series for the benefit of those who did not understand the displacement of one metal from the salt of any other one below it in the series. The question was asked why zinc often builds up on the side of the tank. The answer was to the effect that in a steel tank, stray currents make the tank cathodic and deposition sets in behind the anodes.

Meeting adjourned at 9:30 p. m.

L. R. HINSCH, *Sec.*

WANTED to buy for spot cash a mailing list of firms doing oxidizing. Potential users of McKeon's "Liquid Sulphur" **"The Oxidizing Agent of Today".** — Sulphur Products Co., Inc., Greensburg, Pa.

OBITUARY

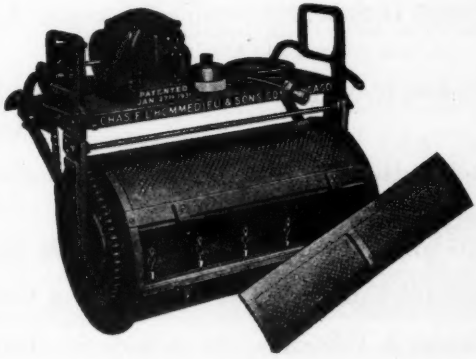
We are sorry to learn that Mr. W. J. O'Neill, Vice-President of the Mercil Plating Equipment Company, Chicago, passed away on June 26th.

We hereby express our sympathy to his family and many friends.

RELIANCE PORTABLE PLATING BARREL

(PAT.)

A complete unit which can be suspended in any plating tank at least 24 in. x 18 in. x 10 in. deep. Capacity of barrel one peck of light stampings or 30 lbs. of screw machine products.



Size of barrel 10 in. x 18 in. Weight 32 lbs. Barrel is made of materials which are acid and alkali resisting and non-absorbent. Can be used with all standard solutions except chromium; also with strong cleaners; and at temperatures up to 150 deg. F. Furnished to operate from A. C. circuit 110 or 220 volt, or from 6 volt D. C. plating circuit.

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BRANCHES: CLEVELAND, LOS ANGELES

DEALERS IN PRINCIPAL CITIES

Membership Report

To June 18, 1936

ELECTIONS

Joseph Di Salle, 223 Fearing Boulevard, Toledo, Ohio.
Active, Toledo Branch

Carlton C. Mitchell, 6823 Maplewood St., Sylvania, Ohio.
Associate, Toledo Branch

Robert Hilfinger, 1617 Dorr St., Toledo, Ohio.
Active, Toledo Branch

Florian E. Webber, 1929 East 185th Street, Cleveland, Ohio.

Edward Thurston, 208 St. Johns Road, Grebe, Sydney, Australia.

George A. Colombie, 295 Hillside St., Torrington, Conn.
Associate, Waterbury Branch

Conrad Corda, 32 Van Wageren Ave., Jersey City, N. J.
Newark Branch

Arthur J. Moore, 212 Almay Road, Rochester, N. Y.
Associate, Rochester Branch

Joseph A. Dutton, 317 Rhinecliff Drive, Rochester, N. Y.
Associate, Rochester Branch

Arthur H. Eriksen, 138 Adams St., Dorchester, Mass.
Associate, Boston Branch

Charles Hall, 1267 Tremont St., Roxbury, Mass.
Active, Boston Branch

Floyd S. Ray, West Newbury, Mass. Active, Boston Branch

Thomas J. Gilmartin, 7 Appleton St., Everett, Mass.
Active, Boston Branch

Charles E. Barber, 131 Beverly St., Boston, Mass.
Associate, Boston Branch

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BUFFING COMPOSITIONS
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Tough durable easy flowing lacquers with excellent adhesive qualities.

For inside or outside exposure; gives unqualified satisfaction.

If you have difficult finishing problems — put them up to the Walker Company. We invariably find a solution to the hardest ones submitted.

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ELIZABETH, New Jersey

J. Arthur Zimmer, 149 W. 6th St., South Boston, Mass.
Associate, Boston Branch

Isadore Baker, 1820 Commonwealth Ave., Boston, Mass.
Associate, Boston Branch

Lawrence Tossi, 81 State St., Cambridge, Mass.
Associate, Boston Branch

Edward F. Foster, c/o United Car Fastener Corp., 31 Ames St., Cambridge, Mass. Associate, Boston Branch

Thomas Palmer, 30 Evergreen Av., Wellesley, Mass.
Active, Boston Branch

Joseph M. Hauber, 59 Newton Ave., East Braintree, Mass.
Active, Boston Branch

William A. Laurence, 624 Main St., Walpole, Mass.
Associate, Boston Branch

Herbert J. Quigley, 135 Old Colony Ave., South Boston, Mass.
Active, Boston Branch

Wesley Colby, Merrimacport, Mass. Active, Boston Branch

George A. DeLorme, 101 Reed Ave., Everett, Mass.
Active, Boston Branch

Edward R. Grant, 161 Prescott, East Boston, Mass.
Associate, Boston Branch

Ben R. Raymond, 161 Prescott St., East Boston, Mass.
Associate, Boston Branch

Albert S. Ellis, United Carr Fastener, Hamilton, Ontario
Active, Toronto Branch

Arthur W. Wilson, 66 Methuen Ave., Toronto, Canada
Associate, Toronto Branch

Lawrence T. Killen, Gananoque, Ontario
Active, Toronto Branch

APPLICATIONS

August Hoffman, 4933 East 11th Street, Cleveland, Ohio,
Cleveland Branch

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NICKEL . . .
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Leroy Camel, 5216, Forest Avenue, Cleveland, Ohio.
Cleveland Branch

Washington Shockley, 452 Broadway, Cleveland, Ohio.
Cleveland Branch

Gustave Klinkenstein, 438 Riverside Ave., Newark, N. J.
Newark Branch

Edward Royal Van Der Hoef, 291 Handy Street, New Brunswick, N. J. Newark Branch

Armand Fritz von Hirsch, Maas & Waldstein Company,
Newark Branch

Joseph Lerner, Freedman Silver Company, Brookly, N. Y.
Active, New York Branch

Charles Favetta, Fidelitone Records, Inc., Astoria, L. I. N. Y.
Active, New York Branch

Louis Henry Cates, Enequist Chemical Company, Inc. Brooklyn, N. Y., Associate, New York Branch

C. E. Proudfoot, 10425 Vernon Ave., Chicago, Ill.
Active, Chicago Branch

F. K. Savage, c/o C. G. Conn Co., Ltd., Elkhart, Ind.
Associate, Chicago Branch

Chas. Unke, 1337 S. 73rd St., West Allis, Wis.
Active, Milwaukee Branch

John Skeba, 1447 Douglas Ave., Racine, Wis.
Active, Milwaukee Branch

RESIGNED

H. G. Stephan, 22 Elm St., Mansfield, Ohio.

J. Krender, 3202 S. Hoover St., Los Angeles, Cal.

TRANSFERRED

R. F. McGuire, Chicago Branch to Milwaukee Branch.

RE-INSTATED

A. P. Munning, 208 Emmett St., Newark, N.J., Newark Branch